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Résumé de l'article

Cet article examine quelques alternances très productives dans trois dialectes de l'arabe moderne : levantin, bani-hassan (bédouin) et soudanais. La première partie de l'article élabore une distinction entre « syllabes de base » (CV, CVV, CVC) et « syllabes marginales » (CVCC, CVVC). Il est suggéré que les syllabes de base sont érigées dans la phonologie lexicale alors que les syllabes maginales sont construites dans la composante postlexicale. La deuxième partie de l'article propose une analyse de *wasla* (« l'enjambement »). Nous démontrons, en outre, que le fait d'établir une distinction entre le niveau segmental et le niveau du squelette permet d'expliquer plusieurs aspects de ce phénomène.

NOTES ON SYLLABLE STRUCTURE IN THREE ARABIC DIALECTS*

Michael Kenstowicz

This paper is divided into three sections. In the first we show how the pervasive alternation of *i* with Ø found in Levantine Arabic can be treated within an explicit theory of the Arabic syllable. In the second section we examine data from the Jordanian Bedouin dialect of the Bani-Hassan which motivate restricting the inventory of core syllables to those containing a maximum of two positions in the syllable rime. We show that CVCC and CVVC syllables are constructed postlexically. In the final section we compare data from the Bani-Hassan and Sudanese dialects which provide interesting support for the models of phonological representation sketched in Halle & Vergnaud (1980) and Clements & Keyser (1982) which factor the string of phonemes into a skeletal tier and a segmental core.

1. The grammars of many modern Arabic dialects generate syllables of the shape CVCC in addition to the pandialectal CV and CVC. However, the construction of the CVCC syllables is constrained by the sonority properties of the individual consonants in fairly familiar ways. In an exhaustive study of such doubly-closed syllables in Lebanese Arabic Haddad (1984) has shown that the first consonant must be more sonorous than the second in order for them to cluster together in the coda. Deverbal nouns are a good place to study the formation of such syllables since CVCC happens to be the underlying canonical shape for a large class of deverbal nominalizations. The CVCC class is also populated by an equally large number of basic nonderived nouns.

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(1)	CVCVC		CVCC	
	dáras	'he studied'	dárs	'a lesson'
	ḥílim	'he dreamed'	ḥílm	'a dream'
	ḥámal	'he carried'	ḥímil	'a load'
	dáfan	'he buried'	dáfin	'a burial'
			bínt	'girl'
			námil	'ant'

When the first postvocalic consonant is more sonorous than the second the underlying CVCC shape may emerge as the phonetic representation (e.g. *dárs, ḥílm, bínt*)[1]. But when the consonants do not exhibit a falling sonority profile a syllable rime cannot be erected underneath them. Language displays two alternative responses to such unincorporable consonants. Some grammars suppress the extrasyllabic consonants (cluster simplification) while others incorporate them into an anaptyctic syllable as either onset, nucleus or coda. Arabic dialects universally take the latter tack. In the dialects surveyed in this paper a single extrasyllabic consonant appears in the coda of the anaptyctic syllable whose nuclear vowel is identical with the unmarked short vowel (*i* in dialects that contrast *i, u* and *a* (e.g. Palestinian), and what is transcribed as *ə* in dialects that contrast just *a* and *ə* (e.g. Syrian)).

Let us now begin to consider how the notion syllable can be precisely defined in order to implement the various phonological processes involved in the realization of the CVCC nominals. The first relevant observation is that the creation of the anaptyctic syllable must occur after the word stress has been assigned. Stress in Levantine Arabic accords with the familiar principle that the rightmost heavy syllable is accented and otherwise the first syllable (with an antepenult limitation).

(2)	ḥámal	'he carried'	ḥílm	'dream'	ḥímil	'load'
	ḥámal-na	'we carried'	ḥílm-na	'our dream'	ḥímil-na	'our load'
	ḥámal-u	'they carried'	ḥílm-ak	'your dream'	ḥíml-ak	'your load'

1. We assume the customary sonority hierarchy of vowel-glide-liquid-nasal-obstruent, although *r* seems to be less sonorous than the nasals in Lebanese Arabic. See Haddad (1984) for details.

Thus, in *ḥámal-na* stress appears on the heavy penult while in *ḥámal-u* stress may be assigned to the initial syllable since the word contains no heavy syllables. The nominal *ḥímil-na* appears to be an exception to the stress principle since the surface heavy penult has been skipped in favor of initial accent. Starting with Brame (1973) virtually all students of Levantine Arabic phonology have interpreted these data as requiring an ordering of stress assignment before epenthesis in a derivation /ḥiml-na/ -> /ḥíml-na/ -> /ḥímil-na/. If we are to maintain this ordering of the rules along with the assumption that epenthesis is a phonological response to extrasyllabic consonants then we can draw an important conclusion about the way in which syllable structure must be assigned. The phonological representation cannot be exhaustively parsed into syllables at a single point in the derivation; rather, syllabification must be permitted to take place in stages, with the intermediate application of phonological rules. In particular, we must assume an initial parse into onset and rime categories to provide the proper representations for the application of stress assignment. (Basically, heavy syllables CVV and CVC will have rimes containing two skeletal positions in contrast to the rime of a light CV syllable which contains only a single element). Only after the stress has been assigned may the unincorporated consonants be organized into an anaptyctic syllable.

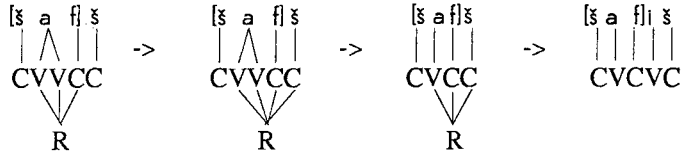
Let us now consider in more detail exactly how syllable structure is to be assigned. In the literature on syllabification it is customary to draw a distinction between formal and substantive constraints on syllable structure (Kaye and Lowenstamm 1981). The formal constraints stipulate an upper bound on the number of positions available in the onset and rime. Arabic is a (1, 3) language allowing just one consonant in the onset and a maximum of three segments in the rime, giving a syllable inventory of CVCC, CVC and CV. The substantive constraints then characterize which particular segments may occupy which slots in the canonical patterns stipulated by the formal constraints.

In a description of Palestinian Arabic, whose data is essentially the same as that in (1), Abu-Salim (1982) adapts the distinction between formal and substantive constraints on syllable shape as follows. He stipulates CVCC as the maximal syllable shape by a formal constraint and erects a rime under all CVCC

nominals on the initial syllable parse, regardless of the phonological properties of the individual consonants. A later rule, ordered after stress assignment, breaks up some CVCC clusters by epenthesis, thereby implementing the substantive constraints. Thus, on this view both /ḥilm/ and /ḥiml/ of *ḥílm* 'dream' and *ḥímil* 'load' constitute syllables at the initial stages of the derivation. This approach is obviously inconsistent with the traditional intuition that epenthesis is called upon to provide vocalic support for consonants that cannot be incorporated into a syllable, since it claims that clusters such as the *m* and *l* in /ḥiml/ do in fact constitute a syllable constituent at an early stage of the derivation. While it is conceivable that such marked sequences are treated as tautosyllabic by some rule or principle of Arabic grammar, I am unaware of any data that would warrant such a claim. In their absence it is surely preferable to maintain that in the derivation of *ḥímil* from /ḥiml/ the final consonants are never tautosyllabic with the nuclear vowel.

Abu-Salim (1982) provides one substantive argument in support of this otherwise counterintuitive analysis. This argument runs as follows. In many Palestinian dialects long-vowel roots of the shape CVVC shorten to CVC before suffixes consisting of a single consonant - in particular the negative *š* and the dative *l*. Thus, we have *šaaf* 'he saw' but *ma šafíš* 'he did not see', *šáf-l-u* 'he saw for him', *šáf-il-ha* 'he saw for her'. Abu-Salim sees the shortening process as one in which the *š* of the negative and the *l* of the dative suffixes are incorporated into the rime of the root syllable by a special rule creating an overlong CVVCC syllable with a four-segment rime, which is subsequently shortened by a rule of «nucleus reduction». The resultant CVCC syllable is then broken up by an epenthetic vowel.

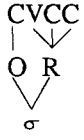
(3)

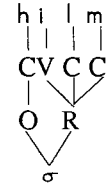


If correct, this analysis obviously constitutes a serious threat to the claim that anaptyxis is a response to extrasyllabic consonants since it appears to require calling /šafš/ a syllable at a certain stage of the derivation even though the string

is ultimately realized as *šafiš* by epenthesis. We shall return to these data later to provide an alternative analysis that permits us to maintain the assumption that the *š* of *ma šafiš* is extrasyllabic at the point where epenthesis applies.

In part Abu-Salim (1982) was lead to this particular analysis by the assumption that the syllabification process consists of providing a matching between a syllable template and the segmental string. Given that the grammar stipulates the template of (4i), a string such as /ḥilm/ can be a matched with the template in a straightforward manner:

(4) i. 

ii. 

On this view syllabification is thus a one step matching between the segmental string or CV tier and the template.

The view of syllabification we shall adopt is rather different. Following Steriade (1982) and Harris (1983) we shall assume that syllable structure is built up gradually by a series of simple rules that assign elements of the skeletal tier to onset and rime categories. These rules are ordered among themselves and may be ordered with other phonological rules of the grammar. In particular we will claim that in the grammar of Levantine Arabic CV and CVC are core syllable types constructed in the lexical phonology, while CVCC syllables are marginal syllable types that arise in the postlexical phrasal phonology. The syllable-building rules creating the core syllables are stated in (5):

(5) i. V -> V
R

ii. C -> C / __ V
O

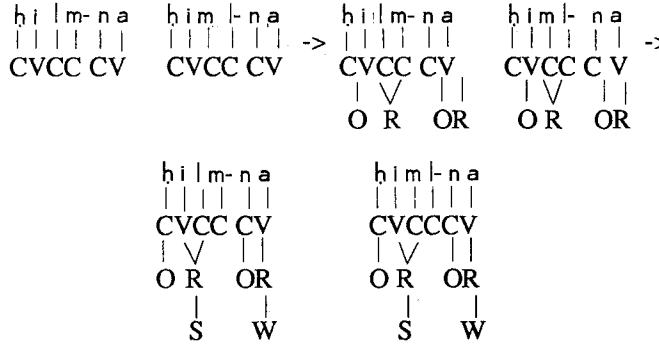
iii. V C
R

The first rule assigns a vowel to a rime position and the second assigns a prevocalic consonant to onset position. We assume that these rules are universal, appearing in all grammars in the order stated, thus guaranteeing that all languages construct CV syllables. The third rule assigns a single unincorporated

postvocalic consonant to a rime position. This rule, which we shall refer to as «the coda rule», is ordered after rule (5ii), «the onset rule», guaranteeing that a single intervocalic consonant appears in onset position.

With the help of these lexical syllable-building rules, the derivations of *ḥílm-na* and *ḥímil-na* proceed as follows:

(6)



In the first step the core syllables are constructed by the rules of (5). The lexical stress rule then assigns a metrical foot (Hayes 1980) over these representations, placing the branching rimes of the first syllables in a strong metrical position and the nonbranching rimes of the second syllables in a weak metrical position.

We are now ready to develop the postlexical rules that treat the unincorporated consonants. The basic principle is that an extrasyllabic consonant goes into the rime of the preceding syllable if it satisfies the falling sonority requirement; otherwise it appears in an anaptyctic syllable. It will turn out to simplify the overall analysis if assignment to the preceding syllable takes place in two steps. First, we assume the rule of (7i) which assigns an extrasyllabic consonant to rime position. We then assume a rule of rime collapse (7ii) which will merge two rimes into one provided that falling sonority is maintained[2].

(7) i. C -> C (R) ii. C_1 C_2 -> C_1 C_2 (R) (cond: C_1 has greater sonority than C_2)

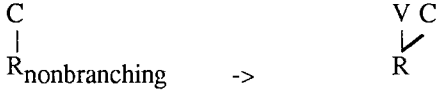
2. The rule of rime collapse is generally optional in Lebanese Arabic. Haddad (1984) points out that *ḥílm* 'dream' may also be pronounced *ḥílim* (while *ḥímil* always requires the epenthetic vowel). Also, application of rime collapse is subject to a good deal of dialectal variation in the Levantine area, reflecting variations in the implementation of the falling sonority profile.

Application of (7i) and (7ii) to *ḥílm-na* of (6) completes the derivation of this word:

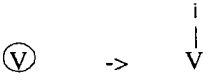
(8)

If the rule of rime collapse does not apply then the new anaptyctic syllables will emerge to the phonetic surface through the action of an epenthesis rule supplying a V slot as the nucleus of the emergent syllable since Arabic does not have syllabic consonants (9). A subsequent «default» rule (10) will supply the empty V slot with an *i* on the segmental tier:

(9)



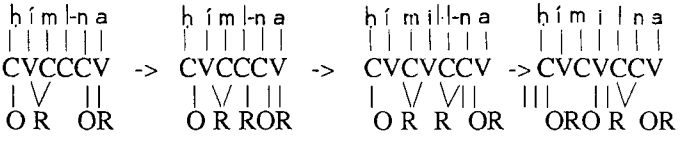
(10)



As we shall see later, it is crucial that epenthesis be broken down into this two-stage operation.

The derivation of *ḥímil-na* initiated in (6) is completed postlexically in (11):

(11)



In the first step the extrasyllabic consonant is assigned to a rime position by rule (7i). Rime collapse (7ii) cannot apply since the falling sonority requirement is not satisfied. Rule (9) then inserts an empty V slot which is spelled out as *i* on the segmental tier by (10). (To save space we have collapsed these two steps into one in (11).) Finally, a consonant is resyllabified to onset position in front of the rime of the anaptyctic syllable.

Let us now try to justify some of the assumptions underlying our analysis. First, it is clear that the rules of anaptyxis are postlexical since they must be defined on the word as it is situated in a phrasal context (Abu-Salim 1980). This is shown by a minimal pair such that in (12c):

(12)			
	a.	fíhim	'he understood'
		fíhim	'understanding'
	b.	fíhim Faríid	'he understood Farid'
		fíhim Faríid	'Farid's understanding'
	c.	fíhim il-wálad	'he understood the boy'
		fíhm il-wálad	'the boy's understanding'

The verbal and nominal stems are pronounced the same before pause or before a word beginning with a consonant. But when the next word begins with a vowel the nominal shows its underlying CiCC shape. The nominal *fihim* 'understanding' belongs to the class of deverbal nominals cited in (1) and can be argued to derive from the CVCC shape on the basis of the paradigm in (13):

(13)		
	fíhim	'understanding'
	fíhm-ak	'your understanding'
	fíhim-na	'our understanding'

If anaptyxis were to take place on the lexical level to convert /fihm/ to /fihim/ then the contrast between the verbal and the nominal forms will have been merged and we will then be unable to explain why these representations diverge when embedded in a phrasal context before a nominal complement such as *il-walad* in (12c). It is well-known that a word-final consonant in Arabic is (re)syllabified as onset to the initial vowel of a following word. Thus the *m* of both the verbal and the nominal forms in (12c) is onset to the following vowel. This onsetting rule must apply before rule (7i) assigning the extrasyllabic consonant of /fihm/ to a rime position. Since the onsetting rule is phrasally defined, rules (7i) and (7ii) must be as well.

The analysis we have developed also claims that in the derivation of CVCC nominals such as *hímil* and *hímil-na* in (11) the *m* is in the rime position of the initial syllable in the lexical phonology but in the onset position of the anaptyctic syllable postlexically. The first claim is forced on us by the existence

of the coda rule (5iii) which assigns a postvocalic consonant to the rime of an immediately preceding vowel. This rule must apply lexically in order to create a branching rime structure crucial for the correct application of the stress rule as in *ḥamál-na*. The grammar would have to be complicated considerably in order to prevent application of this rule to the *m* of /ḥiml/. Since this assumption is strongly implicated by the overall analysis we have developed, one would naturally like to be able to confirm it by looking at other lexical rules that are sensitive to the distinction of closed versus open syllables. However, it turns out that all attempts to verify this assumption in Levantine Arabic are thwarted by the lack of a crucial test case. For example, as we have seen, the stress rule is sensitive to light versus heavy syllables and our analysis predicts that the initial syllables of *ḥímil* and *ḥímil-na* are heavy at the point where stress is assigned (cf. (6)). The initial-syllable stress of these words is thus consistent with our analysis but does not confirm it for recall that initial stress is also the default case when a word lacks a heavy syllable. To provide a true test case we require forms in which these words could be preceded by a stressable prefix. Our analysis claims that the prefix would remain unstressed, the accent being assigned to the heavy syllable of the root. Unfortunately, the morphology of Levantine Arabic does not construct words of this form.

2. One of the advantages in working on a language that is dialectally diversified to the extent that Arabic is, is that sometimes questions that can be posed but not answered for one dialect, can be answered by looking at another dialect. The present case is a good illustration of this point. The Bedouin Arabic dialect of the Bani-Hassan of Jordan (Irshied 1984) exhibits essentially the same pattern of anaptyxis as Levantine Arabic. However, it differs from Levantine in a number of other ways characteristic of Bedouin speech. One of the most interesting is the fact that Bani-Hassan Arabic (BHA) has developed words which begin with a vowel in the underlying representation. Included here is the definite article *al-*, which is prefixed to nouns. In BHA *al-* may receive primary stress, as we can see by the forms cited in (14) below[3]:

3. See Kenstowicz (1983) and Irshied & Kenstowicz (1984) for discussion of stress in BHA. In this dialect binary metrical feet are assigned from left-to-right in contrast to the right-to-left mode of application found in Levantine Arabic. This difference does not affect the bearing of the BHA data on the points developed in the text.

(14)	wálad	'boy'	bínt	'girl'	máktab	'office'
	ál-walad	'the boy'		'the girl'	al-máktab	'the office'

If the root contains all light syllables, then primary stress will appear on the definite prefix. But if the root contains a heavy syllable, then primary stress will fall on that syllable. Given these properties of accent assignment, we now have a way of testing for the structure of the initial syllable of the CVCC nominals such as *ḥímil*. If it is closed, as our analysis claims, then primary stress should not appear on the definite prefix. Before revealing the answer, let us look at some additional material from BHA that bears on the syllable structure of the CVCC nominals in the lexical phonology. As in many other Bedouin dialects, BHA possesses the rule that raises a short low vowel to high in an open syllable (Al-Mozainy 1982, Irshied & Kenstowicz 1984). This Raising rule, which we formulate in (15), is inhibited by adjacent gutturals or by a following dental sonorant.

(15) [+low] -> [+high] / C_1 ___ C_2 (where R is nonbranching,
| | | $C_1 \neq$ guttural, $C_2 \neq$
V R guttural or dental sonorant)

Raising is a robust rule of Bedouin grammar applying at numerous points in the phonology. We illustrate its effect on verb and noun stems with the underlying CaCaC shape in (16). These data also evidence the common Bedouin rule of Elision which deletes *a* from a short open syllable when followed by a short open syllable (essentially in the context ___CVCV).

(16)	ðárab	'he hit'	ðrúb-at	'she hit'
	ḥámal	'he carried'	ḥmál-at	'she carried'
	sáḥab	'he pulled'	sḥáb-at	'she pulled'
	gítal	'he killed'	gtál-at	'she killed'
	rúmaš	'he winked'	rmíš-at	'she winked'
	wálad	'boy'	wlíd-ak	'your boy'
	líban	'milk'	lbán-ak	'your milk'
	fáras	'mare'	frís-ak	'your mare'
	málak	'king'	mlík-ak	'your king'

Thus, underlying /walad+ak/ becomes /wlad+ak/ by elision and then /wlid+ak/ by raising. In /walad/ elision may not apply to the first syllable since the second syllable is closed; raising is prevented from affecting the vowel of the first syllable in /walad/ since it is followed by an *l*, a member of the class of dental sonorants which block the raising of a preceding low vowel. In *liban* from /laban/ raising may apply to the first syllable, but it is blocked from applying to the second stem syllable in *lban-ak* (from /laban+ak/) by the following dental sonorant *n* [4].

We thus have two rules of BHA phonology that are sensitive to a branching rime structure: stress and raising. These rules can now be utilized to test for the syllable structure of underlying CVCC nouns. Recall that our analysis claims that the initial syllable of such nouns is closed in the lexical phonology. We thus predict that in the BHA dialect the initial syllable of such nouns will take the primary stress (instead of the definite prefix) and will fail to raise a short low vowel. The data in (17) confirm both predictions:

(17)

CVCVC		CVCC	
ḥílim	'he dreamed'	al-ḥílm	'the dream'
ḥámal	'he carried'	al-ḥímil	'the load'
dífan	'he buried'	ad-dáfin	'the burial'
fíṭan	'he remembered'	al-fáṭin	'the intelligent one'
		an-námil	'the ant'

To illustrate, our analysis assigns the verb *dífan* and the noun *ad-dáfin* the lexial syllable structure indicated in (18):

(18)

4 . It is worth observing that while a final CVC syllable counts as light for the purposes of accent such syllables must still be treated as closed in CaCaC stems in order to block raising of the final vowel and elision of the first vowel.

Primary stress is assigned to the root syllable of the noun instead of to the definite prefix *al-* since, by hypothesis, it is heavy. The branching rime of the nominal also blocks application of the raising rule, which may apply to the nonbranching rime of the initial syllable of the verb. Postlexical anaptyxis then derives the epenthetic vowel, as in Levantine Arabic.

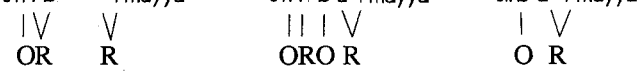
The data from the Bani-Hassan dialect discussed in this section thus corroborate an important feature of our analysis of the nominals in (12). Even though C_2 of a $C_1VC_2VC_3$ nominal is in onset position phonetically two rules of the lexical phonology (raising and elision)[5] require representations in which C_2 is in the rime position of the initial syllable. This abstract syllable structure thus supports the model of syllabification developed in Steriade (1982) in which syllable structure is assigned in stages through the course of the phonological derivation.

Another feature of the analysis we have developed for the CVCC nominals is the claim that there is resyllabification to onset position in front of the epenthetic vowel so that while the *m* of *ḥimil* 'load' is in the rime position of the first syllable in the lexical phonology, it is in the onset position of the anaptyctic syllable in the postlexical phonology. The latter claim is motivated by the fact that nominal *ḥímil* 'load' and verbal *ḥámal* 'he carried' have equivalent sounding syllabifications. But are there any rules of grammar that crucially depend on the onset status of the consonant preceding the epenthetic vowel, making this a phonological as opposed to merely a phonetic fact? Once again the Bani-Hassan dialect provides crucial evidence.

Like all Arabic dialects, BHA has resyllabification to onset position across word boundaries: *ðarab al-walad* 'he struck the boy' is pronounced [ðarab al.walad]. Unlike in Levantine Arabic, BHA has extended the rule syncopating unstressed short high vowels in nonfinal open syllables to the phrasal level. Thus while verbal *šírib il-máyya* 'he drank the water' and nominal *šírb il-máyya* 'the drinking of the water' contrast in Levantine Arabic, they fall together in BHA as *šírb al-máyya*. We thus assume the derivation in (19) for BHA where resyllabification opens the final syllable of the verb, leading to syncope of the unstressed vowel:

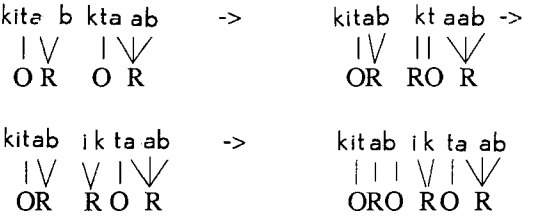
5. Irshied & Kenstowicz (1984) show that these rules are cyclic and hence lexical.

(19)



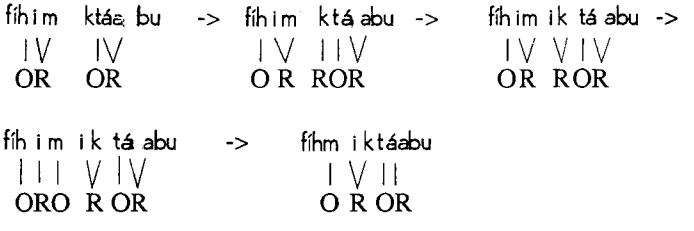
As in Levantine Arabic epenthesis operates at the phrasal level in BHA. Underlying /katab ktaab/ 'he wrote a book' is realized as [ki.ta.b ik.taab] by the post-lexical rules assigning the extrasyllabic *k* of /ktaab/ to rime position, followed by epenthesis, in turn followed, by hypothesis, by the resyllabification rule.

(20)



If resyllabification in front of the epenthetic vowel were actually a phonological rule operative in the grammar, it would have the opportunity to feed syncopation of the preceding open syllable. If this opportunity were exercised, then we would have strong reason for supposing that there is indeed resyllabification in front of the epenthetic vowel. The fact that underlying representations such as /fihim ktaabu/ 'he understood his book' and /širib ghawa/ 'he drank a coffee' are pronounced with syncope as [fíhm ik.táa.bu] and [šír.b igh.áwa] thus support the phonological status of the proposed resyllabification in front of the epenthetic vowel. The former is derived as in (21):

(21)



The BHA phrasal syncope rule also permits us to show that the rime collapse rule of (7ii) operates postlexically. Consider words of the shape CVCCiC. The final consonant will resyllabify to onset with a following vowel-initial word, opening

the stem-final syllable, leading to syncope of the *i*. Following Levin (1984) let us suppose that the syllable is a projection of the nucleus. Elimination of the nuclear vowel by syncope will thus destroy all syllable structure rendering the erstwhile tautosyllabic consonant extrasyllabic.

(22)

As the data in (23) show this extrasyllabic consonant behaves exactly the same with respect to rime collapse and anaptyxis as the final consonant appearing in underlying CVCC nominals. If this consonant has greater sonority than the preceding consonant then anaptyxis will take place; if it has less sonority than the preceding consonant, then rime collapse may apply to yield a doubly-closed CVCC syllable.

(23)	yírṣid	'he ambuses'
	yírṣ.dál.walad	'he ambuses the boy' (cf. /dars/-> dárs 'lesson')
	yílmis	'he touches'
	yílms.ál.walad	'he touches the boy' (cf. /ḥilm/-> ḥílm 'dream')
	yímlis	'he levels'
	yímil.s.a.lárḍ	'he levels the land' (cf. /ḥiml/-> ḥímil 'load')
	yífnid	'he confirms'
	yífin.d.ál.xabar	'he confirms the news' (cf. /dafn/->dáfin 'burial')

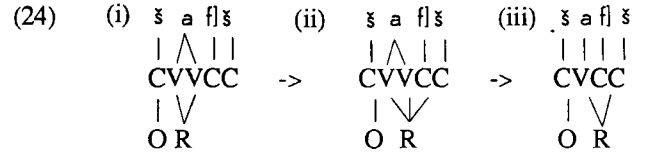
These data show that the rule of rime collapse building the doubly-closed CVCC syllables operates postlexically since it is fed by a phrasal application of syncope. It is thus reasonable to infer that the doubly-closed syllable of *dars* and *ḥilm* is also constructed postlexically, as our analysis of (8) has claimed.

Given that CVCC syllables are constructed postlexically, we might consider restricting the inventory of core syllables to just CV, CVC and CVV; i.e. to syllables with a maximum of two slots in the rime. Actually, this simplification permits another interpretation of Abu-Salim's (1982) Palestinian data cited earlier. Recall that in PA, in contrast to other Levantine dialects, verbal roots of the shape CVVC shorten to CVC before the negative suffix *-š* and the dative *-l*: *šáaf*

'he saw', *ma šáfiš* 'he did not see', *šaf-l-u* 'he saw for him', *šaf-il-ha* 'he saw for her'. Abu-Salim interprets this shortening as the reflex of a special rule incorporating the dative and negative suffixes into the root syllable, yielding an overlong CVVCC syllable which triggers a shortening of the root vowel. A subsequent epenthesis rule breaks up the final cluster of /šafš/ to yield *šáfiš*. This analysis is problematic for our entire approach to syllabification since it claims that the negative *-š* is tautosyllabic with the root vowel at a certain point in the derivation but yet later triggers epenthesis. One of the major contentions of our analysis is that epenthesis is a response to extrasyllabic consonants. It is therefore important for us to reexamine these data to see if we can offer a counter analysis in which the *-š* is extrasyllabic in the postlexical phonology. Of course, we want *-š* and *-l* to be extrasyllabic without having to posit an adhoc rule detaching these elements from the root syllable, especially since under Abu-Salim's analysis the grammar already has a special rule attaching these very suffixes to the root syllable in order to spark off the shortening of the root vowel.

Our counter analysis of these data challenges Abu-Salim's assumption that CVVC is a member of the basic core syllable structure. Instead, we shall claim that the core syllable-building rules are constrained to construct rimes containing at most two moras, yielding CV, CVV and CVC as the inventory of core syllables. CVVC syllables will arise postlexically by assignment of the extrasyllabic final consonant to a rime position by rule (7i) followed by the rime collapse rule of (7ii). Let us first see how this proposal works for the Palestinian data cited by Abu-Salim before considering its more general implications.

Under our proposal *šáaf* will have the lexical syllable structure of (24). As in Abu-Salim's analysis, we too assume the existence of a special rule for the Palestinian dialect triggered by the negative and dative suffixes. This rule will be formulated to incorporate the extrasyllabic consonant of the CVVC root into the preceding rime, creating an overlong 3-mora rime, triggering the shortening of the root vowel. The form *šáfiš* thus receives the partial derivation of (24):



The extrasyllabic C of the negative suffix will then be assigned to an anaptyctic syllable postlexically. Note that under this analysis the negative *-š* remains extrasyllabic throughout the entire lexical derivation, permitting us to maintain the position that epenthesis is a response to extrasyllabic consonants.

Crucial to this analysis is the assumption that CVVC is not a core syllable in PA. There are at least two reasons to believe this assumption independent of the above analysis. First, CVVC syllables in LA have a much more limited distribution than the core CV, CVC and CVV syllables. CVVC syllables appear essentially in just two environments. First, in the immediate output of the syncope rule deleting unstressed short high vowels in an open syllable (cf. *ṣáaḥib* 'friend' m., *ṣaaḥbe* /< ṣaaḥibe/ 'friend' f.). Secondly, CVVC may appear as the final syllable of a stem: *ktáab* 'book', *šáaf* 'he saw'. These forms have arisen historically from the deletion of a vowel in Classical Arabic, where the ban on CVVC syllables was true of the phonetic representation (cf. Cl. Ar. *al-kitaab-u* 'the book', *šaaf-a* 'he saw'). Finally, there is some indication that the ban on CVVC syllables is still operative in Levantine Arabic, at least in the inner recesses of the lexical phonology. Roots of the shape CVVC show an obligatory shortening before consonant-initial subject suffixes, but not before object suffixes:

(25)

sta-šáar	'he consulted'	sta-šáar	'he consulted'
sta-šáar-u	'they consulted'	sta-šáar-u	'he consulted him'
sta-šár-na	'we consulted'	sta-šáar-na	'he consulted us'

The shortening before subject suffixes is found in all Levantine dialects including Palestinian, indicating that subject suffixes must be added to the inventory of suffixes triggering the incorporation of the final consonant of the CVVC roots into the preceding rime. Note that Abu-Salim's analysis will not extend to these data since there is no evidence that the *n* of *-na* in *sta-šár-na* from /sta-šaar-na/ is ever in anything but onset position to the following vowel. These data suggest that CVVC syllables are banned from the lexical phonology and thus make credible the alternative analysis for Palestinian *šáfiš* in which the final consonant is extrasyllabic, triggering epenthesis.

To briefly summarize, we have developed an analysis of the pervasive i-Ø epenthesis alternation found throughout the modern Arabic dialects within the

context of an explicit theory of syllabification. With this analysis as background let us now turn to data which bear crucially on the two-stage formulation of epenthesis as the insertion of a V slot which is subsequently spelled out as *i* by the default rule.

3. As mentionned earlier, one of the most interesting features of the Bani-Hassan dialect is that it has developed words which begin with a vowel in the underlying representation. This feature is probably an historical innovation, as we can see by comparing the situation with Sudanese Arabic, a modern dialect that parallels Classical Arabic in the relevant respects. In Sudanese Arabic, passive verbs exhibit a paradigm such as the following:

(26)	in-kátal	'was killed'
	al-wála.d in.kátal	'the boy was killed'
	wála.du n.kátal	'his boy was killed'

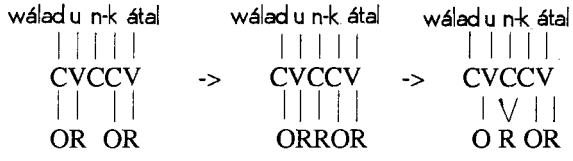
The verbal form *in-kátal* is exceptional in that stress appears on the second syllable, shunning the initial heavy syllable, which is where the regular stress rule should assign the accent (cf. *tárjamat* 'she translated', where the initial heavy syllable is stressed by the regular rule). An important additional feature of the data in (26) is that the initial *i* of the verb is missing when the preceding word ends in a vowel. As Hamid (1984) observes, both the aberrant stress as well as the vowel-zero alternation can be explained if it is assumed that the passive prefix is simply /n-/ and that the initial *i* is the product of the postlexical epenthesis rule[6]. Under these assumptions the passive /n-katal/ will be assigned the lexical syllable structure of (27):

(27)

6. A number of other prefixes work the same way as the passive in Sudanese Arabic including the intransitivizing prefix *t-* of measures V and VI and the infixed *t* of mesure VIII. To illustrate the latter we cite *jáma?* 'to gather together', *ijtáma?* 'to meet with'. It is also worth observing that *i* is the vowel used to break up clusters in loanword adaptation: e.g. *bálif* 'valve'.

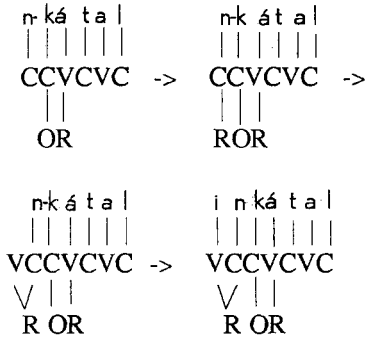
Lexical stress will be assigned to the initial syllable *ka*, the *n* remaining extrasyllabic until the postlexical stage. Postlexically, extrasyllabic *n* will be assigned to a rime position by (7i). If the preceding word ends in a vowel this rime will collapse with that of the preceding word to yield a rime that spans the words boundary.

(28)



When preceded by a consonant or pause the passive prefix will fail to undergo rime collapse instead evoking epenthesis. By hypothesis, epenthesis consists of insertion of a V slot on the skeletal tier (9) followed by a later rule (10) linking an empty V slot to an *i* on the segmental tier.

(29)



The data in (30) below show that the vowel of the definite prefix *al-* has exactly the same distribution as the joining vowel *i* of the passive in Sudanese Arabic. It is unaccented as well as missing entirely after a word ending in a vowel:

(30)

al-wálad	'the boy'
dára.b al.wálad	'he hit the boy'
dára.bu l.wálad	'they hit the boy'

Since the *a* of the morpheme *al-* has exactly the same distribution as the *i* of the passive we clearly would want to give it the same analysis. But in the traditional

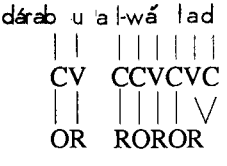
theory which represents phonological structure as a linear string of phonemes, this would require a postlexical rule to change the epenthetic *i* to *a* before the definite prefix. Such a solution is suspicious since, in general, postlexical rules are blind to the lexical properties of the individual morphemes composing a word (Kiparsky 1982). But in the Three-Dimensional model of phonological representation we are assuming that draws a distinction between the segmental and skeletal tiers, a clear solution to this problem is available. We shall claim that the underlying representation of the definite prefix is as in (31), where the consonant *l* of the morpheme is associated with a skeletal position but the vowel *a* is not:

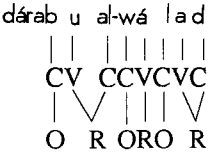
(31)


When prefixed to a noun such as *walad*, we have the representation of (32):

(32)


This representation has a couple of interesting properties. First, given the assumption that stress assignment is defined on the rime projection of the word, which in turn is defined on the skeletal tier, we automatically explain why the *a* of the definite prefix is unaccented. The stress rule will not see it. Second, the *l* of the definite prefix is extrasyllabic when we enter the postlexical phonology and hence will be subject to exactly the same principles that control the behavior of the passive prefix. In particular, it will be assigned to a rime position by (7i). When the preceding word ends in a vowel, the rule of rime collapse will apply, preempting epenthesis.

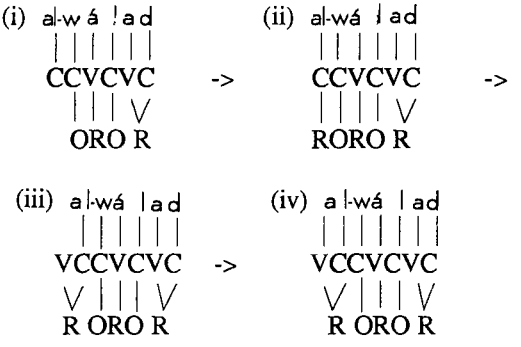
(33)




Again, given that syllable structure is defined on the CV tier, the rime collapse rule will not see the *a* of the definite prefix, which in no way interferes with the application of the rule.

Contrast this situation with the one in which the representation of (32) is preceded by a consonant or pause, preventing the application of rime collapse.

(34)



After assignment of the extrasyllabic consonant to rime position, epenthesis will supply this rime with a V slot (iii). We now have a representation (34iii) containing a skeletal V element unlinked to any segmental material and a segmental vowel phoneme unlinked to any skeletal position. It is natural to suppose that these two elements will be linked by some version of the general association conventions governing wellformed autosegmental representations (Goldsmith 1976). This linkage will then preempt the default rule that supplies unlinked V slots with an *i* phoneme on the segmental tier.

The analysis of *waṣla* («joining») in Sudanese Arabic that we have just proposed relies crucially on the distinction between the segmental and skeletal tiers. It is instructive to consider the kind of analysis that will be required for the Sudanese data in the «standard» theory where the distinction between the segmental and skeletal tiers is not made. The *i* ~ Ø alternation exhibited by the passive prefix can be accounted for by an epenthesis rule, as in the analysis we have proposed. But consider the problem presented by the definite prefix. If the underlying representation for this morpheme is /al-/, then we fail to explain why its vowel can never be accented by the stress rule. In addition we must invoke a truncation rule to delete the *a* vowel after a word ending in a vowel. But the

environment for this rule is precisely the complement of the epenthesis rule already present in the grammar. In fact, the *a* of *al-* has exactly the same distribution as the epenthetic vowel, suggesting that the underlying representation for the definite prefix is just /l-/. But under this interpretation we require a rule to change the epenthetic vowel from *i* to *a* before the definite morpheme. This «rule» is suspicious for a number of reasons. First, this rule is postlexical since it follows epenthesis which is postlexical by virtue of its phrasal nature. But postlexical rules are normally not sensitive to the lexical properties of the individual morphemes composing a word. Second, the rule changing *i* to *a* would have to be restricted to just the epenthetic vowel. Underlying *i* does not change: *darábti lwálad* 'you f. hit the boy'. Clearly the «rule» changing epenthetic *i* to *a* is nothing but a disguise for the fact that *a* is an idiosyncratic, distinctive property of the definite prefix and hence must be included in its underlying representation. But the underlying representation cannot be /al-/ for the reasons mentioned above. This dilemma is avoided in our analysis which assigns the definite prefix the underlying representation of (35):

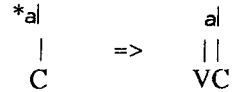
(35)


With (35) we represent the fact that *a* is a distinctive unpredictable property of this morpheme. Yet since it lacks a V slot we also explain why it has exactly the same distribution as the epenthetic vowel. Epenthesis inserts an empty V slot which becomes linked to the *a* of (35) preempting the application of the default rule that spells out empty V stots as *i* on the segmental tier.

Let us now consider the data in the Bani-Hassan Bedouin dialect that correspond to the Sudanese data of (26) and (30). The Sudanese data represent essentially the same state of affairs as exists in Modern Standard Arabic and, by hypothesis, also in Classical Arabic, the historical antecedent of BHA. First, with respect to the definite article, a striking characteristic of BHA, as we have seen earlier, is that its vowel counts for stress.

(36)	a.	ál-walad	'the boy'
	b.	ðára.bál-walad	'he struck the boy'
	c.	ðrúb-uál-walad -> [ðrú.bál-walad]	'they struck the boy'

This fact suggests that in BHA the joining vowel of other dialects has been reinterpreted diachronically as underlying, giving the representation in (37) and of course making the vowel of the definite prefix eligible to receive an accent by the lexical stress rule.

(37)


Another striking feature of BHA in contrast to other dialects is the loss of word-final vowels before the definite prefix (36c). This sandhi process is a quite general rule in BHA operating in a large variety of syntactic contexts (see Irshied 1984). We thus must stipulate the truncation rule of (38):

(38) V -> Ø / ___ V

Given that the joining vowel has been reinterpreted as underlying for the definite article, we might expect the same change to have affected the vowel of the passive prefix. The relevant data appear in (39). The fact that the passive prefix bears the lexical stress confirms this expectation.

(39)

a.	ín-gital	'was killed'
b.	ál-walad ín-gital	'the boy was killed'
c.	ál-axú n.gital	'the brother was killed'
	(cf. ál-axu 'the brother')	

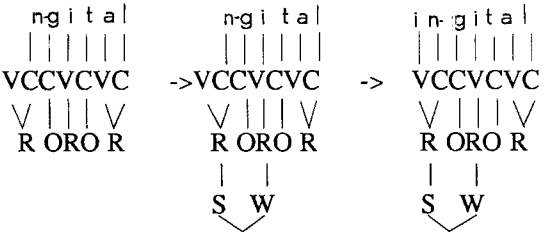
(39a) shows the passive prefix postpausally; it bears the major word stress, in contrast to Sudanese Arabic (26). (39b) shows the same thing postconsonantally. The truly interesting form is that of (39c), where the word preceding the passive prefix ends in a vowel. Here we find (i) that the vowel of the passive prefix is missing and (ii) that the stress of the verb appears to «jump» into the preceding word.

The analysis we shall propose for these data is based on a quite literal interpretation of the BHA analogical change as one in which the joining vowel has been reanalyzed as part of the underlying representation of the relevant morphemes. In particular we assume that the underlying representation of the passive in BHA contains the V slot of the erstwhile joining vowel but has no associated entry on the melody tier.

(40)

If we suppose that the passive prefix has a V slot in the underlying representation then it will be able to receive the word stress assigned by the lexical rule of stress assignment since stress, we assume, is a metrical relation defined on syllable rimes, which are built on the skeletal tier, not the segmental tier. The passive *ingital* will receive the derivation sketched in (41):

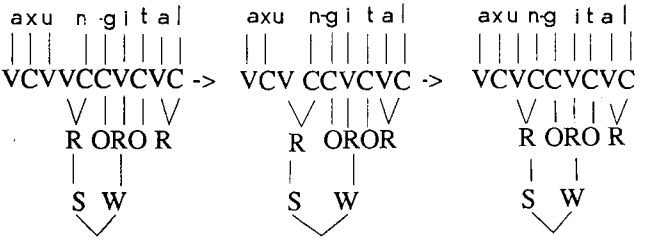
(41)



In the first step a S-W foot is erected under the first two syllables in the lexical phonology. Postlexically, the empty V slot is supplied with an *i* vowel on the segmental tier.

We can now account for the apparent loss of the *i* in (39c) if we agree to interpret the truncation rule (38) as an operation defined on the CV tier eliminating the first of two successive V skeletal positions but leaving the associated melody segment intact. This free melody segment will now link to the free V slot of the passive prefix by some version of the autosegmental well-formedness condition that links up free melody segments with free skeletal positions. The proposed derivation is given in (42):

(42)



Thus, the apparent «leap» of stress from the passive prefix into the preceding word is illusory. Rather stress is assigned to the empty V slot in the lexical phonology while the V slot is supplied with a melodic interpretation in the post-lexical phonology either by virtue of the truncation of a preceding V slot or by the action of the default rule. Obviously once again this analysis is possible only if we make a distinction between a V slot and the filling of it by the default rule.

Finally, in cases where the second of the two successive V slots is linked to an element of the segmental tier, the segment set adrift by the truncation of the first V slot will fail to anchor to V_2 since Arabic does not permit two vowel segments to be linked to a single skeletal position.

(43)

ðrubua l-wa lad		ðru bua l-wa lad	
| | | | | | | | | | |	->	| | | | | | | | | |	
CCVCVVCCVCVC		CCVC VCCVCVC	

The floating *u* of this representation fails to receive a phonetic interpretation in the same way as the floating *a* of (33) does.

The analysis we have developed for the deletion of a vowel before the vowel of the definite prefix and the pseudo deletion of the vowel of the passive prefix after a word-final vowel claims that these two processes are really just one -deletion of the first of two successive V positions on the skeletal tier. This contention is supported by further conditions on the truncation rule. As the data in (44) show, truncation will not delete a long vowel before the definite prefix. (The deleted vowel is indicated by the overstrike.):

(44)	humiʔṭu al-axu al-misaari	'they gave the brother the money'
	humiʔṭu wludu al-misaari	'they gave his son the money'
	humiʔṭu axuu al-misaari	'they gave his brother the money'

We must thus reformulate truncation to require that the deleting V slot be associated with a nonbranching rime:

(45)

$$V \rightarrow \emptyset \,/\, \underset{\displaystyle |}{\underline{\quad}}\, V$$

$$R_{\text{nonbranching}}$$

Now if vowel truncation (45) is at the root of the apparent loss of the *i* of the passive prefix, we predict that when the passive verb is preceded by a word terminating in a long vowel, no floating melody element will be derived since there is no truncation after a branching rime. Consequently, the empty V slot of the passive prefix should be filled with an *i* by the default rule. This prediction is confirmed, as shown by the phrase in (46), which receives the derivation in (47)[7]:

(46) axúu ínigital 'his brother was killed'

(47)

ax u ng i t a|	
| | ∧ | | | | | |	underlying representation
VCVVVCCVCVC	
inapplicable	truncation
ax u ing i t a|	
| | ∧ | | | | | | |	default i-insertion
VCVVVCCVCVC	

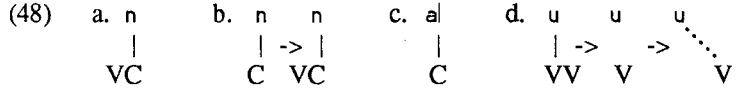
4. Conclusion

In this section we have examined data which motivate partitioning the traditional linear string of phonemes into two parallel levels - the segmental tier and the skeletal tier - along the lines proposed in Halle & Vergnaud (1980) and Clements & Keyser (1982). The relationship between these two tiers exhibits many of the same properties as the perhaps better understood relationship between the tonal tier and the sequence of tone-bearing units. It is well-known from the study of tonology that one must posit the existence of tone bearing units which, either underlyingly or through the course of the derivation, are unassociated with an element of the tonal tier. Such toneless elements will then aquire a tonal value, either through association with a member of the tonal tier or through a default rule. Tonology also has taught us to recognize the existence of floating tones - elements of the tonal tier not associated with a tone-bearing unit. These floating tones may appear directly in the underlying representation or arise in the

7. To be completely accurate we should point out that the suffix *-u^h* 'his' ends in a weak aspiration and thus *axúu^h ínigital* is a more accurate transcription. Note that we cannot appeal to the presence of this *h* as the reason why truncation blocks in (46) since truncation of *-u^h* applies quite regularly when the vowel is short as in (44): *hum iʔtu wkud-u^h al-misaari* realized as [wkudalmisaari].

course of the derivation through the elimination of a tone-bearing unit. One of the most active lines of phonological research of the past few years has been to suggest that these various mismatches between the tonal and the tone-bearing tiers are manifestations of more general relations that pervade all aspects of phonological organization. In our study of *waṣla* in Bani-Hassan and Sudanese Arabic we claim to have discovered isomorphs of each of these four mismatches in the relation between the segmental and the skeletal tiers. Let us enumerate them here. First, there is the underlying unlinked V slot of the passive prefix in Bani-Hassan (48a). Recall that this V slot acquires the articulation of a preceding vowel if there is one and is realized as *i* by default if there is no preceding vowel. Second, there is a derived representation of exactly the same form that arises in Sudanese Arabic through epenthesis (48b). Third, we have found reason to postulate a floating segmental phoneme *a* without an associated V slot in the underlying representation of the definite prefix in Sudanese Arabic (48c). Finally, we have claimed that a floating segmental phoneme is derived from the truncation of the associated V slot in Bani-Hassan (48d):

(48)



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