Edge-In Association

Moira Yip
Brandeis University

Edge-In Association

Moira Yip

Brandeis University

Non-linear phonology associates melodies (tones, phonemes, feature bundles) with skeletal slots (syllable positions) one to one in some direction. Two main candidates for the unmarked direction of association have been suggested. Either association proceeds from left-to-right, or from the outside in. Left-to-right has been assumed in analyses of tone (Goldsmith 1976, Clements 1985, Yip 1980, Pulleyblank 1986,) and template morphology (McCarthy 1981, Archangeli 1984). Outside-in has been suggested by research on reduplication (Marantz 1982, McCarthy and Prince 1986) to account for the correlation between affix position and direction of association : left-to-right in prefixes, versus right-to-left in suffixes.

I shall argue that association works from the edges inwards in stems as well as in affixes, and that in the case of a root or stem this involves association first to both edges of the domain, and then filling in of the center. If this is right one general principle will cover both reduplication (and other affixation) and initial stem association, a surely desirable result. It is not possible here to re-analyze all cases of alleged left-to-right association as edge-in association: I shall limit myself to one prominent example, Semitic morphology, and then suggest the predictions made for other cases.

1. Theoretical Assumptions and Background

The theory I shall assume has the following properties:

a. Phoneme melodies associate to templates one-to-one.
b. Spreading, if any, is by rule.
c. Templates consist of syllabic positions (Levin 1985), and are probably prosodic in the sense of McCarthy and Prince (1986,1987). For convenience they will be referred to as C, V here, since the issue of their precise nature is orthogonal to the issue of directionality.
d. Only unpredictable information is present in lexical entries. Predictable values are supplied by redundancy rules (Kiparsky 1982, Archangeli 1984, Pulleyblank 1986).

The theory must also specify the direction of association, and I will argue that the unmarked case is association from the edges inwards, both in stems and in affixes. First, let me give some background on the origins of the idea that association must proceed from the edges inwards in some cases. It was noticed that in reduplication prefixing reduplication copied material from the beginning of the word, and suffixing reduplication copied material from the end of the word. In a theory like that of Marantz (1982) in which the entire word melody is copied this requires LR association in prefixes and RL association in suffixes, and since this is overwhelmingly the normal situation he suggests that a general principle of outside -in association is at work.

In the case of affixation (including reduplication) only one edge is free for association, the already-associated stem occupying the other edge. In stems themselves, however, both edges are free, so a natural extension of this idea would give rise to a system in which initial and final melodic elements first anchored to initial and final slots, then medial elements associated to medial slots in some way. [1] The aim of this paper is to show that there is evidence for just such a process of outside-in association in stems, and that such an account is superior to a LR association account.

Let me briefly review the parallel but contrasting properties of left-to-right (LR) association, and then of edge-in (EI) association.

(1) Excess Skeletal Slots:
Excess slots will be on the right edge in LR association, medial in EI association. Three logical possibilities arise: spreading by rule, assignment of default values, and loss of excess slots. The last posssibility is rare or non-existent, suggesting a principle of template satisfaction (McCarthy and Prince 1986). LR association thus predicts spreading of the rightmost element, or default values on the right edge. EI association predicts spreading of medial elements, or medial default values.

(2) Excess Melodic Elements:
Excess melodic elements will also be on the right edge in LR

association, and medial in EI association. Three possibilities again arise: association by rule to create contours, loss of excess melodic material, and provision of extra skeletal slots. IR association thus predicts contours on the right edge, and loss of rightmost melodic material. EI association predicts medial contours, and loss of medial melodic material. The provision of extra skeletal slots would imply a principle of Melody Satisfaction, and we shall see later that such a principle exists in Classical Arabic.

A few comments are in order. First, note that when spreading was thought to be automatic the existence of rightward spreading was taken as striking evidence for IR association, but ever since it was shown that spreading is by rule only (Pulleyblank 1986:80-89) this pattern of rightmost spreading no longer falls out automatically from IR association, but rather requires the addition of a language-particular rule. [2] Medial spreading, by contrast, has apparently escaped notice, but I shall argue below that it not only exists, but is the normal case in Classical Arabic and can only be simply accounted for in an EI association theory. At the same time apparent rightward spreading in Classical Arabic turns out to have more complex origins, invalidating it as the basis of an argument for IR association in this case.

A second contrast noted in (1), the occurrence of default values on the right edge versus medially, is one of the most interesting. Tonal systems such as Tiv (Pulleyblank 1986) show evidence of default L tones on the right edge (cf yévèsè) . Segments, however, show evidence of default values in the middle (cf mutakaatib, see section 2.2). Whether this is a real difference between tone and segments, or a language specific difference, I am not yet able to say, but the existence of medial default values in Classical Arabic argues strongly for EI association in that case.

The contrasts in (2) (loss of final/medial melodies, or creation of final/medial contours) are less useful as diagnostics for IR versus EI association than at first appears, because melody loss is rather rare in stem association, and may have quite different underlying causes, as I shall show. As for contours, many languages, such as Chinese, show contours freely on any syllable, while others never allow them at all. What is more, although tonal systems often create contours on final syllables only, segmental systems rarely do.[3] I conclude that the distribution of contour tones cannot be used as evidence for IR association pending a fuller understanding of their nature (see Yip 1987b). Instead, I would suggest that extrametricality may play a role here, reserving a final tone until the end of the lexical phonology for later attachment.

In the remainder of this paper I shall show that Classical Arabic

morphology is best explained by edge-in association. My analysis
will depend heavily on McCarthy (1981), and I accept without
argument what he showed so clearly: Semitic languages derive words
by the non-concatenative method of associating three morphemes: a
template, supplied by the binyan; a consonant melody which is the
verb root; and a vocalic melody, which is the aspectual and tense
marker. I differ from him in the details of how these three
elements associate: I shall argue that association is not IR, but
EI.

2. Classical Arabic Association
2.1 Consonant Association
2.1.1 1-1 Matches
EI association will associate the initial and final melodic
elements with the initial and final free slots, anchoring the two
ends. Remaining slots and melodic elements will then be associated
in the same way, moving inwards, until all slots are associated.
The results of this procedure in the case of identical numbers of
vowels and consonants are shown in (3):

(3)

Edge	C V C	C V C V C	C V C C V C
Assoc	| |	| |	| |
	s m	k t b	d ḥ r j
Filling		C V C V C	C V C C V C
In		| | |	| | | |
		k t b	d ḥ r j

Clearly, identical results are obtained for IR association, so
nothing distinguishes the two procedures for these forms.

2.1.2 Excess slots:
There are several binyanim with more slots than consonants, and
they are listed in (4):

(4) Biliteral roots: all binyanim, eg
 I   samam
 II   sammam

   Triliteral roots:
(a)   (b)
 II kattab   IX ktabab
 V   takattab   XI ktaabab
 XII ktawtab   XIV ktanbab

   Quadriliteral roots:
QIV dḥarjaj

Biliteral roots always spread the final consonant; triliterals
spread either the medial or the final consonant, and quadriliterals
spread the final consonant. We have, then, an apparently mixed

system, with rightward spreading suggesting LR association, and medial spreading suggesting EI association. I shall first give an account that makes use of EI association throughout, then I shall contrast it with a LR association analysis.

2.1.2.1 Medial Spreading

EI association predicts that if there are excess slots the medial consonant is likely to spread , since after anchoring the ends the association procedure is one of "filling-in", and the medial consonant will if necessary fill more than one slot [4]. This is what happens in the forms in (4)a, typified by the second binyan, kattab, as shown in (5). (The fifth binyan, takattab, , and the twelfth, ktawtab are identical except for the prefixed /t/ and infixed /w/).

(5)
```
C V C C V C --> C V C C V C
|     |   |       |   V   |
k     t   b       k   t   b
```

These common binyanim can thus be accounted for simply and directly under an EI association account. The LR association account will be discussed at the end of the next section.

2.1.2.2 "Rightward Spreading"

The remaining forms in (4) show apparent rightward spreading, which I have suggested may be diagnostic of LR association. If, as the previous section claims, EI association is the norm, how do we explain the rightward spreading cases?

First, I postulate a leftward spreading rule for the biliterals like samam. This is descriptively adequate, and on a par with the LR account, which requires a rightward spreading rule. [5] The derivation is shown in (6):

(6)
```
        C V C V C    --->    C V C V C
        |   |                |   \ |
        s   m                s   m
```

The remaining cases, 9th,11th, and 14th, and QIV binyanim, have a different explanation. I will argue that these binyanim require that the last two consonant slots be jointly linked, and that this precedes or otherwise overrides general association, leaving exactly the right number of slots for the remaining consonants to link to. In order to argue this I need to digress and consider the quadriliteral binyanim in more detail.

The most noticeable thing about the quadriliteral roots is that they only occur with templates that have at least four slots, thus ensuring that no melodic elements are lost. [6] This suggests that in addition to a principle of template satisfaction Semitic has a principle of Root Realization.

Given this fact, and the additional fact that the triliterals are
the morphological norm, one might suppose that quadriliteral roots
would make use of the subset of triliteral templates that have
space for four or more consonants. In (7) I give the candidate
triliteral binyanim, and alongside them quadriliterals that appear
to be their counterparts.

(7)   II   kattab   QI   daḥraj
        V   takattab   QII   tadaḥraj
        IX   ktabab   *dḥaraj   BUT QIV dḥarjaj
        XI   ktaabab   *dḥaaraj
        XII   ktawtab   *dḥawraj
        XIV   ktanbab   QIII   dḥanraj

The parallellism is far from perfect, and one might wonder why.
Notice particularly that two of the triliteral binyanim with no
obvious quadriliteral counterparts , IX, XI, ktabab and ktaabab,
have doubling of the final consonant, whereas their putative but
non-existent quadriliteral versions, *dḥaraj and *dḥaaraj, do not.
Suppose that this doubling is a fundamental requirement of these
binyanim.[7] Then there is no way to realize a complete quadriliteral
root on these binyanim while simultaneously achieving the double
linking; dḥarar or dḥajaj would involve melody loss. To satisfy
both requirements we need a template with five slots, and since
none exists among the triliteral inventory, a new one is created by
addition of a C slot to IX, giving QIV ,CCVCCVC, dḥarjaj, which
satisfies both requirments. [8]

This line of argument also explains our earlier problem: why are
the triliteral IX and XI binyanim, ktabab and ktaabab realized with
spreading of the final rather than the medial consonant? Because
they require double linking of the final consonant, and this
overrides the general association principles. [9]

The same double linking requirement is presumably at work in
ktanbab and ktaabab, but the heavy first syllable makes deriving an
appropriate quadriliteral binyan difficult. Any attempt to add an
extra slot so as to meet both Root Realization and double linking
requirements would require addition of an entire syllable, since
dḥanrjaj, dḥaarjaj, dḥanrajj or dḥaarajj would be out on other
grounds. Apparently, then, Root Realization is more important than
the double linking requirement, and we get plain QIII dḥanraj with
no double linking. The absence of a quadriliteral equivalent of XI
ktaabab and XII ktawtab is presumably accidental: XI and XII are
rare anyway, and so are quadriliteral roots.

A summary of the derivation of selected forms from (4) is given in
(8):

(8)   samam   kattab   ktabab   dharjaj
       CVCVC   CVCCVC   CCVCVC   CCVCCVC
                                  V   V

       s   m   k t b   k t b   d ḥ r j

EI   CVCVC   CVCCVC   CCVCVC   CCVCCVC
Assoc | | | | | | V | V
       s   m   k t b   k t b   d ḥ r j

Fill   CVCCVC   CCVCVC   CCVCCVC
In | V | || V || |V
                  k t b   kt   b   dḥ r j

Spread–CVCVC
ing | \ |
        s   m

I have tried to explain both the cases of apparent rightward spreading, and the forms of the quadriliteral binyanim, as the result of EI association, a leftward spreading rule, Root Realization, and a double linking requirment. To the extent that I have succeeded, rightward spreading cannot be used as an argument for LR association. Let me therefore end this section with a summary of McCarthy's LR account of these facts.

The first problem encountered in a LR association account is how to deal with the existence of the binyanim with medial spreading, like II and V, and the surprising absence of the expected forms with rightward spreading, like *[katbab], since initial association will inevitably create a tb cluster in medial position. McCarthy assumes that [kattab] is derived from the intermediate */katbab/ by a special rule which erases the association lines, given in (9) (McCarthy 1981:392):

(9) Second, Fifth Binyan Erasure (=McCarthy's (24))
              C V C] [2nd, 5th binyanim]
      0 <– |
            [μ]
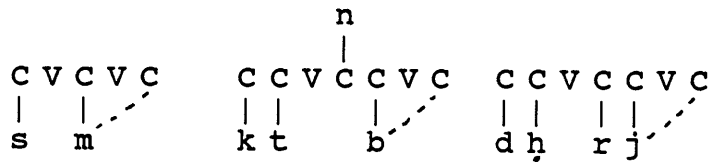 |
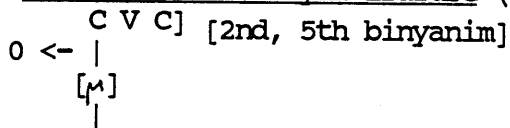
            [root]

Subsequently the melody to the left spreads onto the now free C slot, giving [kattab] from [katbab]. This rule must either be restricted to triliteral roots, or allowed to apply to the quadriliterals like dahraj as well, but its effects are then immediately undone by reassociation of the now free consonant by the general association principles.[10] The LR account, although descriptively adequate, treats these binyanim as exceptional. The EI account, however, treats them straightforwardly: there is medial spreading in kattab as a result of normal fill-in procedures, and the quadriliterals like dahraj show no spreading simply because

there are equal numbers of consonants and slots.

In contrast to the problem presented by the forms with medial
spreading, the forms in (4) in which the rightmost consonant
spreads onto the excess slots fall out simply from IR one-to-one
association, followed by a rightward spreading rule. Notice that
the rule is still required, since the alternatives would be loss of
unfilled slots, or provision of default values (such as ?, t, or
w). Typical derivations are shown in (10):

(10)

```
                           n
                           |
   C V C V C      C C V C C V C      C C V C C V C
   |  |  ,-'      | |    |  ,-'      | |   | |  ,-'
   s     m        k t    b'          d ḥ   r j'
```

The second problem for the IR account is that it fails to provide
any explanation for the array of quadriliteral binyanim, and
instead wrongly predicts quadriliteral counterparts for all six
triliteral binyanim with four consonant slots, and cannot explain
the addition of QIV with five consonant slots.

2.1.3 Excess Melodic elements: Right-end Loss
A second difference between EI and IR association lies in the fate
of excess melodic elements: EI predicts medial loss, IR predicts
right-end loss. In Classical Arabic melody loss is limited to
quinquiliteral roots: as we have seen, quadriliteral roots always
appear with quadriliteral templates. McCarthy (1981) claims that
the rightmost consonant is lost when matching a quinquiliteral root
to a quadriliteral template, giving maqnat from /mqntš/, and that
this argues in favor of IR association, but I shall argue that
these forms do not bear on the issue of direction of association,
since what is happening is that roots of five or more consonants
are being reanalyzed to conform to the canons of the language, and
that those canons have a maximum of four consonants per root. The
reanalysis drops off one consonant in a variety of ways which are
not fully predictable. Another version of this argument can be
found in McCarthy and Prince (1987), which includes a careful and
elegant analysis of the Classical Arabic broken plural. For a
different view, see Hammond (1986).

The two circumstances under which this root reanalysis is necessary
involve the broken plurals of nouns, and the diminutive (Wright
1951:167). Note particularly that broken plural formation is no
longer productive for quinquiliteral roots, suggesting that
something other than the normal association process is needed in
such cases.

The broken plural template has room for only four consonants, so the quinquiliteral roots are reanalyzed in a variety of ways. Typical data is given in (11):[11]

(11) a.   safarjal   safaarij   'quince'
     b.   farazdaq   faraaziq   'burnt cake'
     c. /w/: ?ustuwaanat   ?asaatiin   'pillar'
        /n/: qalansuwat   qalaasiyu   'sort of cap'
        /m/: batlamiyuus   bataalisat   'Ptolemy'
        /t/: dumustuq   damaasiq   'Byzantine governor'

(11a) shows reanalysis by loss of the final consonant, and McCarthy and Prince, citing Dieterici (tr.) (1852:353) state that this is the preferred method. I shall assume that this is the result of making the final root consonant extrametrical. SInce extrametricality is only possible at edges, only the initial or final consonant can be excluded from association in this way. Why it is always the final consonant I do not know.

(11b) shows loss of a medial consonant, contra the predictions of LR association. (11c) shows loss of what Wright (1951:231) calls a "servile consonant". These are consonants which resemble affixes, even though they are not necessarily real affixes. The consonants chosen include /w,t,n,m,/, and they are frequently medial, not on the right edge. I shall call them pseudo-infixes.

Reanalysis of these consonants as infixes allows a sort of spurious conformity to the Root Realization principle referred to earlier.

I conclude from these facts that simple LR association, with excess consonants dropping off the right edge, does not account for the broken plurals of quinquiliterals. Since the lost consonant may be final or medial, simple EI association will also not account for the facts. Instead, a process of root regularization is at work, resulting in quadriliteral "roots" which associate to the broken plural template without further loss.

2.2 <u>Vocalism</u>
Turning to the vocalism, I shall show that EI association together with underspecification allows for a very simple statement about vowel melodies in Classical Arabic verbs. The melodies can be given as (u(i)), and their surface realization is the result of edge-in association, and default insertion of the features for /a/ on any unassociated vowel(s).

McCarthy (1981) gives the melodies in (12) (the groupings and base melodies are mine):

MOIRA YIP

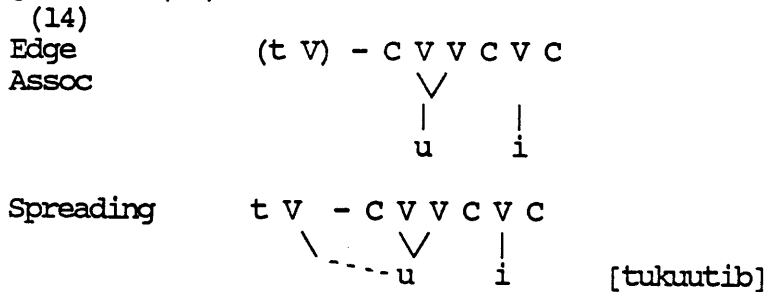| (12)		Surface	Base melody
(a)	Perfective Active	$a^4{}_2$	$\emptyset$
	Imperfective Passive	$u\ a^4{}_2$	u
	Active Participle	$u\ a^3{}_1\ i$	u i
	Passive Participle	$u\ a^4{}_2$	u
(b)	Perfective Passive	$u^3{}_1\ i$	u i

Leaving (b), the Perfective Passive, aside for a moment, notice
that the only vowel which appears more than once in a surface
melody is /a/, and that the other vowels, u,i appear only at the
edges of the melody. This pattern can be derived immediately if the
underlying melodies are those shown on the right in (12), that is
(u (i)), and they associate to the edges , with all unassociated
vowels surfacing as [a] by default. As an illustration, consider
the vocalism of the Active Participle, such as VI binyan
mutakaatib:

(13)   C V C V C V V C V C

                            u   i

Edge   C V C V C V V C V C
Assoc.   \   /
                 u   i

Default   C V C V C V V C V C
Rules | \ | / |
                 u   a   i   [mutakaatib]

Note particuarly that there is no spreading of either underlying
vowel, /u/ or /i/.[12] If there is no melody, as in the Perfective
Active, then all the vowels surface as /a/ as the result of the
Default Rules. If the melody consists of a single vowel, /u/, as in
the Imperfective Passive and the Passive Participle, the /u/
associates to the left edge only, and all the other vowels surface
as /a/ by default. This last case requires a slight addition to the
principles of EI association: apparently the left edge has some
sort of priority, at least in Classical Arabic, so that a single
vowel associates there and not to the right edge (or to both
edges).

I have left the data in (12b), the Perfective Passive, till last
since it apparently spreads /u/ onto up to three vowels. Inspection
of the forms, however, shows that more than one [u] is found in
only two cases. First, if both [u] are tautosyllabic, as in kuutib.
Any account will need a principle requiring that tautosyllabic
vowels are identical, so as to rule out forms like *kuatib. This is

a general fact about Classical Arabic syllables, so let us assume
that /u/ associates to some superordinate syllable node, say the
nucleus, and that if this nucleus is complex it is realized on both
slots. The second case is if the prefix /tV/ is present, as in
tukuttib, tukuutib. (V and VI binyanim). I suggest that this prefix
is extrametrical, so association begins on the following nucleus;
at the end of the cycle, when /tV/ ceases to be extrametrical, /u/
spreads leftward onto the prefix vowel slot. [13] The derivation is
given in (14):

(14)

Edge   (t V) - C V V C V C
Assoc   \/
                            | |
                            u   i

Spreading   t V - C V V C V C
                     \ _ _ \/ |
                      ` - - -u   i   [tukuutib]

The superficially different vocalisms of the perfective passive, [u
u u i] , and the active participle, [u a a a i], can now be reduced
to one melody, /u i/, general EI association, and extrametricality
of the prefix tV. [14]

A LR association account, by contrast, needs a special rule.
McCarthy (1981:401) proposes an analysis in which the /i/ anchors
to the rightmost V slot, then the other vowels anchor one-to-one
left to right, with spreading. He thus effectively makes use of
edge association, since both ends are associated before the middle;
however, he has recourse to a language specific and domain specific
rule , Vowel Association, whereas I would claim that it is only an
instance of general edge association.[15]

The vocalism provides striking evidence in favor of an EA approach,
since no special association rules are needed, and a maximally
simple statement of the possible melodies is made possible.

There is some independent evidence for the status of /a/ as the
default vowel in Classical Arabic morphophonology. Brame (1970)
discusses some interesting alternations that provide suggestive
evidence supporting the analysis of /a/ as the default vowel. The
relevant fact is that /a/ appears to be the epenthetic vowel in the
lexical phonology of Classical Arabic, and Archangeli (1984) , Yip
(1987a) have argued that epenthesis usually inserts an empty V slot
which then surfaces as the default vowel. The epenthetic /a/ shows
up in the first syllable of the first binyan, in the 'hollow'
nouns, and in the definite article. In all these cases one or more
vowels are needed to fill the nuclei of syllabic templates, and
these vowels then surface as /a/. For a detailed analysis see Yip
(to appear).

MOIRA YIP   549

3. Conclusion

I have argued here that one particular set of data, Classical
Arabic verbal morphology, is an example of edge-in association in
stems. Several other templatic morphology languages appear to
exhibit EI association. Tigrinya for example, shows widespread
medial gemination as exemplified by the frequentatives sababara,
masakakara (Leslau (1941)). Tigre (Palmer 1962:18ff) shows medial
gemination in the broken plurals such as damamm@l, tanakk@l.
Languages of this kind lend themselves naturally to an EI
association analysis. See also Takelma (Goodman 1983), Syriac
Arabic (Hoberman 1987), Wuxi tone (Yip 1987b).

The obvious question to ask is whether all association operates in
an edge-in fashion, or whether it is just an additional option to
be added to the IR and RL choices. A full answer involves a careful
look at all the cases of IR and RL association to see if they can
be reanalyzed as EI association. If this turned out to be possible,
it would resolve an odd inconsistency in the literature. Marantz
(1982) and McCarthy and Prince (1986) argue that reduplication is a
kind of affixation, and that association works from the ends in. In
suffixes, then, association should normally be RL. In contrast,
tonal analyses of suffixing languages have quite generally assumed
that association is IR throughout the phonology, both in roots and
in suffixes. Pulleyblank (1986) is a particularly careful example
of such an analysis. We must thus conclude that either tone and
segmental phonology associate by different principles, or
reduplication is not affixation at all (see McCarthy and Prince
(1987) for a view along these lines) or that these analyses must be
reconsidered.

Footnotes
This paper has benefited from the comments of a number of people,
including the participants in the MIT Linguistics Colloquium,
Brandeis University Phonology classes, and particularly Diana
Archangeli, Michael Hammond, John McCarthy, and Alan Prince. All
errors are of course my own.

1.The process is thus one of pattern matching, as can be seen
particularly clearly in tonal systems (see Rialland 1987, Yip 1987).

2.The apparent assymetry between rightward and leftward spreading,
however, is still accounted for by IR association: if there is
spreading, it can only be to the right, since this is where there
will be empty slots.

3. Rotuman (Saito 1981) creates short diphthongs on final vowel
slots (cf pure / puer), but, like the tonal cases, this is arguably
post-cyclic. See also Odden (1987:525, fn2) on Gta?.

4. Another way to think of this procedure is that the remaining consonant associates to both ends of the unassociated domain, continuing the process of associating from the edges inwards. This would predict slightly different results in other cases.

5. Both accounts also allow for the existence of a language with only forms like sasam: either it is RL association, or EA with rightward spreading.

6. I know of one exception: the quadriliteral root /xlbs/ has a related triliteral form [xalab]. Presumably the root has been reanalyzed as a triliteral (see section 2.1.3).

7. Broselow (1984) argues that Amharic has a Perfective template which require a double linking in this way, giving forms like labbasa. See section 3 on Tigrinya.

8. Wright (1951:49) says that IX and XI show intensiveness of colour or of defects, (IX is permanent, XI transitory) and that this is shown by doubling of the last consonant. Note that Wright (p49) equates QIV with IX on semantic grounds, since QIV is also intransitive and intensive.

9. It is possible that this double linking is the result of a later reduplication rule and spreading of the rightmost melodic element. How the double linking is established is not my main concern in this paper, but the requirement of double linking has its syntactic counterpart in requirements for case identity (see Yip, Maling and Jackendoff 1987).

10. Other researchers (eg Pulleyblank 1986:115) have argued that automatic reassociation cannot undo the effects of a rule that specifically disassociates the same two elements. If this is so, McCarthy's rule must be restricted to the triliteral roots.

11. -at is a suffix in both singular and plural. The w/y alternation is the result of a glide insertion rule.

12. Whether the default rules insert one instance of /a/, as required by the OCP, or several, does not bear on the issues here.

13. Note too that the spreading is leftward, like in the consonants.

14. Note that when this prefix occurs with the active participle it is no longer extrametrical because it is preceded by another prefix, mu, and thus no longer at an edge. We thus get mutakaatib, but tukuutib.

15. The fact that only /a/ spreads is a result of its being the rightmost unanchored vowel in his analysis. However, he could also make use of underspecification to achieve this result.

References

Archangeli, D. 1984. Underspecification in Yawelmani Phonology
     and Morphology. Doctoral Dissertation, M.I.T., Cambridge, MA.
Archangeli, D. and D. Pulleyblank 1986 The Content and Structure
     of Phonological Representations. ms. University of Arizona
     and University of Southern California.
Brame, M 1970 Arabic Phonology: Implications for Phonological
     Theory and Historical Semitic. Unpublished MIT PhD
     Dissertation.
Broselow, 1984 Default Consonants in Amharic Morphology. In M.
     Speas and R. Sproat, ed., Papers from the Jan 1984 MIT
     Workshop in Morphology MIT Working Papers in Linguistics, 7.
Clements, G.N. 1986. The Geometry of Phonological Features.
     Phonology Yearbook.2:225-52.
Dieterici, F. (tr.) 1852. Ibn 'akil's Commentar zur Alfijja des
     Ibn malik, Ferd. Dummler's Verlags-Buchandlung, Berlin.
Goldsmith, J. 1976. Autosegmental Phonology. Doctoral Dissertation,
     M.I.T. Garland Publishing.
Goodman, B. 1983. Takelma Verbal Morphology. Unpublished ms.,
     University of Texas at Austin.
Hammond, M. 1986. Templatic Transfer in Arabic and Hebrew. Ms,
     University of Wisconsin-Milwaukee.
Hoberman, R. 1987. Local and Long-Distance Spreading in Syriac
     Morphology. Ms, State University of New York at Stony Brook.
Kiparsky, P. 1982. Lexical Phonology and Morphology. In I.S.
     Yang, ed., Linguistics in the Morning Calm, Linguistics
     Society of Korea, Hanshin, Seoul.
Leslau, W. 1941 Documents Tigrinya Klincksieck, Paris.
Levin, J. 1985. A Metrical Thoery of Syllabicity. Doctoral
     Dissertation, MIT, Cambridge, Mass.
Marantz, A. 1982. Re Reduplication. Linguistic Inquiry 13:483-
     545.
McCarthy, J. 1981. A Prosodic Theory of Non-concatenative
     Morphology. Linguistic Inquiry 12:373-418.
McCarthy, J and A. Prince 1986. Prosodic Morphology. Unpublished
     ms., Brandeis University and University of Massachusetts at
     Amherst. MIT Press, to appear.
McCarthy, J. and A. Prince 1987. Quantitative Transfer in
     Reduplicative and Templatic Morphology. Unpublished ms,
     Brandeis University and University of Massachusetts at
     Amherst, MIT Press to appear.
Odden D. 1986. On the Role of the Obligatory Contour Principle in
     Phonological Theory. Language 62.2: 353-383.
Palmer, F.R. 1962. The Morphology of the Tigre Noun. Oxford
     University Press, London.
Pulleyblank, D. 1986. Tone in Lexical Phonology D. Reidel,
     Dordercht, Holland.

EDGE-IN ASSOCIATION

Rialland, A. and M. Sangare 1985. Tons lexicaux et tons flottants
    dans les noms en Bambara: Principes d'association. To appear
    in Actes de Comptes de phonologie nonlineaire de Lyon.

Saito, M. 1981. A Preliminary Account of the Rotuman Vowel System.
    Unpublished ms, MIT, Cambridge, Mass.

Wright, W. 1951. A Grammar of the Arabic Language. 3rd Edition.
    Cambridge University Press.

Yip, M. 1980. The Tonal Phonology of Chinese. Doctoral
    Dissertation, M.I.T., and Indiana University Linguistics Club.

Yip, M. 1987a. English Vowel Epenthesis. To appear in Natural
    Language and Linguistic Theory.

Yip, M. 1987b. Tone Contours as Melodic Units: Tonal Affricates.
    Ms, Brandeis University.

Yip, M. (to appear) Template Morphology and the Direction of
    Association. To appear in Natural Language and Linguistic
    Theory.

Yip, M., J.Maling and R. Jackendoff 1987. Case in Tiers. Language
    63.2:217-150.