Tashlhiyt Berber triconsonantal roots
A binary branching head-complement structure

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GLOW XXX

(1) The segmental composition of triconsonantal roots

<table>
<thead>
<tr>
<th>Tashlhiyt Berber</th>
<th>Classical Arabic</th>
</tr>
</thead>
<tbody>
<tr>
<td>constrained composition</td>
<td>free composition</td>
</tr>
<tr>
<td>↓ at least one sonorant in the root</td>
<td>↓ voiceless obstruents ex. $k_f$ « discover »</td>
</tr>
<tr>
<td>constrained arrangement</td>
<td>free arrangement</td>
</tr>
<tr>
<td>↓ at least one sonorant is preceded by an obstruent</td>
<td>$lms$ « touch »</td>
</tr>
<tr>
<td></td>
<td>$mr$ « be sick »</td>
</tr>
<tr>
<td></td>
<td>$mlk$ « own »</td>
</tr>
</tbody>
</table>

(2) Proposals
- Tashlhiyt Berber triconsonantal roots have a binary branching head-complement structure where two and only two segments (those that stand for the head and the complement) are constrained.
- The structure is rendered by means of a tree diagram analogous to those that represent syllabic and syntactic constituencies.
- Evidence from the Geminated Imperfective: the binary branching head-complement hypothesis is proposed to (i) determine which consonant geminates in the root, and (ii) capture the distribution of the “geminating verbs” among the “geminable verbs”.

I. What is in a root?

(3) Indo-European
Root ≃ the smallest meaningful lexical unit that a set of items share in common made of consonants and vowels
e.g. reason, reasoning, reasonable < reason receive, perceive, conceive < *ceive (cranberry morphemes, cf. Aronoff 1976, Spencer 1991).

(4) Semitic
Root: semantically-related words share a common root that consists entirely of consonants

Classical Arabic
e.g. $\sqrt{ktb} + a > katab$ Active-Perfective, “he wrote”
$- + u-i > kutib$ Passive-Perfective “it has been written”, root-and-pattern morphology
$- + i-a > kitaab$ “book”


Hebrew

(5) Berber
Root: ambiguous status, debate, hybrid morphological system
Galand (1988), Cantineau (1950): the root is the minimal meaningful unit, entirely composed of consonants, ordered in a fixed way and bearing a general meaning
e.g. dl “cover!” , idla “he covers”, amdl “cloud”, imdl “cap” < ✓ dl

N. V.
amkraz tkrizt
Root
krz
krz
Pattern
m12a3 12i3
Affix
a- t- t-

Kossman (1997:30): consonants and vowels should not be separated systematically, as they sometimes share lexical information
e.g. “accompany” mun < ✓ mn or ✓ mun, “oversee” matr < ✓ mtr or ✓ matr, “border on” wala < ✓ wl or ✓ wala, “speak” sawl < ✓ swl, ✓ wl or ✓ sawl.

Secret languages (Taqjmit):
argaz > tirragzjugz “man”
tafuxt > tiffarxjurx “girl”
sawl > tissawljuwl “speak”

II. Data, observations

(6) Data
The examples are taken from a list of 221 verbs containing verbs with no full vowels except in the final position. (The whole list is available within the paper entitled “On the internal structure of Tashlhiyt Berber triconsonantal roots” at http://mlahrouchi.free.fr/downloads.html)
Loanwords are excluded (e.g. Cl. Arabic: xdm “work”, fhm “understand”, hkm “judge”).

<table>
<thead>
<tr>
<th>Root</th>
<th>Verb</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ gzm</td>
<td>gzm</td>
</tr>
<tr>
<td>✓ kjm</td>
<td>kjm</td>
</tr>
<tr>
<td>✓ bsr</td>
<td>bsr</td>
</tr>
<tr>
<td>✓ zgr</td>
<td>zgr</td>
</tr>
<tr>
<td>✓ bdr</td>
<td>bdr</td>
</tr>
</tbody>
</table>

b.
| ✓ frd | frd | « nibble » |
| ✓ krz | krz | « plough » |
| ✓ krf | krf | « tie up » |
✓ xrb xrb « scratch »
✓ smd smd « add »

c.
✓ ndr ndr « squirt »
✓ mgr mgr « reap »
✓ lkm lkm « arrive »
✓ nkr nkr « stand up »
✓ rgl rgl « knock »

d.
✓ knw knu « lean »
✓ kru kru « rent »
✓ zlw zlu « loose »
✓ bry bri « scratch »
✓ kmy kmi « smoke »

(7) Observations
i. Each root contains at least one sonorant. 95% of the roots listed in the data obey this constraint. Counterexamples: bdg “be wet”, bzg “swell” and zd “inhabit”.

ii. A root may contain at most two sonorants, as in (6c) and (6d). Counterexamples such as rmy “be tired”, rwi “make dirty” and mlw “be limp” do not exceed 3% of the whole data.

iii. At least one sonorant in the root is preceded by an obstruent. 87% of the data undergo this constraint.

iv. The sonorant can appear in the final position of the root (6a) as well as in the medial position (6b).

v. If a root begins with a sonorant, it also ends with a sonorant (6c). 14 roots out of 221 contradict this statement.

vi. If two sonorants are adjacent in the root, then the second sonorant is necessarily a high vocoid (6d). Counterexamples: frn “sort” and lmz “swallow without chewing”.

III. A binary branching head-complement structure

In Tashlhiyt Berber, the segmental composition of the verbal triconsonantal roots obeys structural and distributional constraints in the forefront of which are the following constraints:

(8) Each verbal triconsonantal root contains at least one sonorant

(9) At least one sonorant in the root is preceded by an obstruent

(10) - How can we state a conceptual framework that accounts for the internal organisation of segments in the root and the co-occurrence restrictions they undergo?

(11) Proposal
Vocal triconsonantal roots display a binary branching head-complement structure
The structure is hierarchical, rendered by means of a tree diagram analogous to those which represent syllabic and syntactic constituencies:
- The segments standing for the head and the complement share the same node in the tree.
- The remaining segment, linked to a higher node in the tree, is a satellite segment that occurs indifferently at the left or right of the head-complement pair.
- The satellite segment can be of an obstruent or a sonorant type.

**NOTA:** On the notions of Head and Complement and the way they are used in phonological theory, the reader is referred to Dependency Phonology (Anderson 1985, 2002, Anderson & Ewen 1987), Government Phonology (Kaye, Lowenstamm & Vergnaud 1985, 1990) and Metrical Phonology (Hammond 1984, Prince 1985). The binary branching head-complement hypothesis is also reflected in the theory of syllable representation developed by Levin (1985): the syllable is viewed as a projection of the nucleus (N). The coda is defined as the “complement” of N while the onset is the “specifier” of the syllable: e.g. pin

```
N'' / \ ...
|   N' /
|    /\ ...
|   N \ ...
|   | \ ...
p i n
```

(12) The head and the complement obey 3 conditions
a. The head never accommodates a sonorant except when it is followed by another sonorant
b. An obstruent never occurs as the complement
c. The head is immediately on the left of the rightmost sonorant in the root

(13) a. Head obstruent

```
 b s r k f m g z m l k m
```

```
 f r d k r f x r b f r n ...
```

b. Head sonorant

```
 k n w b r y k r w r m y ...
```

(14) Left-headed structures

The head is systematically located on the left branch of the inferior node in the tree
Cf. the Linear Correspondence Axiom proposed by Kayne (1994).

**NOTA:** Within Syntactic structures, the Linear Correspondence Axiom universally states that all syntactic constituents are left-headed (the head always precedes its complement).
(15) **Head obstruent!**

One major property:

*The head is the obligatory element in the structure*

Syntactic and syllabic constituencies:

- In the syllable structure, the nucleus is assumed to be the head of the syllable essentially because it is the only obligatory constituent. The onset and the coda are optional.
- In syntactic structures, the head is almost the obligatory element, as opposed to the complement or the specifier, which are optional. A verb may indeed form a VP by itself.
- Within root structure, we expect obstruents which function as the head of the root to behave similarly to their counterparts in syntactic and syllabic structures. If there were any monoconsonantal roots in Tashlhiyt Berber, we expect them to be made exclusively of obstruents.

(16)

| g  | “be, become” |
| f  | “give”       |
| kk | “pass”       |
| SS | “eat”        |

(17)

<table>
<thead>
<tr>
<th>C</th>
<th>CC</th>
<th>CCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>OS</td>
<td>OOS</td>
</tr>
<tr>
<td></td>
<td>SS</td>
<td>OSO</td>
</tr>
<tr>
<td></td>
<td>SO!</td>
<td>SOS</td>
</tr>
<tr>
<td></td>
<td>OO!</td>
<td>SSS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OOO!</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SSO!</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SOO!</td>
</tr>
</tbody>
</table>

(see sec. VI)

(18)

**IV. Biconsonantal roots**

Within the binary branching head-complement structure, we expect biconsonantal roots to contain nothing but the head and its complement.

In Tashlhiyt Berber, biconsonantal roots are generally assumed to have an underlying complex form (*cf.* among others Iazzi 1992, Dell & Elmedlaoui 1991).

<table>
<thead>
<tr>
<th>Aorist</th>
<th>Imperfect</th>
<th>Preterit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lps</td>
<td>3pms</td>
</tr>
<tr>
<td>“wear”</td>
<td>ls</td>
<td>lss</td>
</tr>
<tr>
<td>“overnight”</td>
<td>ns</td>
<td>nssa</td>
</tr>
<tr>
<td>“break”</td>
<td>rz</td>
<td>rzz</td>
</tr>
<tr>
<td>“be sold”</td>
<td>nz</td>
<td>nzza</td>
</tr>
</tbody>
</table>

*GEM*
b.
“sleep” gn ggan gn gn-γ
“leave, let” fl ffal fl fl-γ
“fall” dṅr ttʰar dṅr dṅr-γ
“bust” gl ggal gl gl-γ
c.
“lean” knu knnu kʰ na kʰ ni-γ
“be dirty” rku rkku rka rki-γ
“remove, louse” zru zrru zra zri-γ
“sew” gnu gnnu gʰ na gʰ ni-γ

Verbs in (18a) behave similar to verbs in (18c) in that they:
(i) geminate the second consonant and end with the vowel a in the Imperfective
(ii) use the vowel a in the Preterit 3rd person masculine singular and the vowel i in the
    Preterit 1st person singular (γ being the 1st ps morpheme marker).
By contrast, verbs in (18b):
(i) form their Imperfective by geminating the initial consonant and infixing the vowel a
(ii) their Preterit merely exhibits the two radicals.

Iazzi (1992) has suggested that biconsonantal verbs as in (18a) contain an underlying
vocalic segment in the third position which has no more than one distinctive feature:
[+vocalic]. An ancient segment that went out of use, revealing a state of the language where a
vowel, probably u, occupied the final position of the verb.

Basset (edition 2004: 64) noticed that certain Berber varieties use the vowel u instead
of a in the Preterit 3rd pms:
e.g. i-nsu “to overnight” in Snous, Menacer and Ouargla varieties
    i-lsu “to wear” in Ghadames variety,
i-rzɯ “to break” in Seghrouschen, Snous, Menacer, Ouargla and Ghadames varieties
    i-nzu “be sold” in Menacer and Ouargla varieties.

(19)

V. Problematic data

(20) Triconsonantals

Triconsonantal roots which contradict the analysis are sorted into two types:
(i) Roots in which the only sonorant is initial, as in rḵʷs “hide”, rḵz “dance” and
    nfd “be stirred up”.
(ii) Sonorants-less roots such as bdg “be wet”, bzg “swell” and bxs “discredit oneself”.

6
(21) rkz « dance »

a.  

(b)

rkz

(22) bdg "be wet"

a.  

(b.  

c.  

d.  

e.  

f.  

(23) Biconsonantals

<table>
<thead>
<tr>
<th>Aorist</th>
<th>Imperfective</th>
<th>Preterit</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. &quot;mill, grind&quot;</td>
<td>zd(\delta)</td>
<td>zzad(\delta)</td>
</tr>
<tr>
<td>b. &quot;buy&quot;</td>
<td>s(\gamma)</td>
<td>ssa(\gamma)</td>
</tr>
<tr>
<td>c. &quot;hollow&quot;</td>
<td>(\gamma)z</td>
<td>qqqaz</td>
</tr>
<tr>
<td>d. &quot;graze&quot;</td>
<td>ks</td>
<td>kssa</td>
</tr>
<tr>
<td>e. &quot;give&quot;</td>
<td>f(\kappa)</td>
<td>akka</td>
</tr>
</tbody>
</table>

VI. Geminated Imperfective

As a process used to form the Imperfective, gemination concerns verbs containing no more than three consonants, without initial or medial vocoids. The process has been treated in several studies, including Boukous (1987), Cadi (1987), Chaker (1973, 1984), Chami (1979), Dell & Elmedlaoui (1988, 1991 and 2002), Jebbour (1996) and Louali & Philipson (2003).

(24) Geminate the onset! (Dell & Elmedlaoui 1988:11):

“The segment which is geminated in the Imperfective stem is that segment which is syllabified as an onset by Core Syllabification in the basic stem”

(25) Dell & Elmedlaoui (2002:118)

<table>
<thead>
<tr>
<th>Preterit</th>
<th>Imperfective</th>
</tr>
</thead>
<tbody>
<tr>
<td>kr(\tilde{\alpha})</td>
<td>kkr(\tilde{\alpha})</td>
</tr>
<tr>
<td>xxng</td>
<td>xxng</td>
</tr>
<tr>
<td>mmrz</td>
<td>mmrz</td>
</tr>
<tr>
<td>(\gamma)bd</td>
<td>(\gamma)bd</td>
</tr>
<tr>
<td>(\eta)ml</td>
<td>(\eta)ml</td>
</tr>
<tr>
<td>(\delta)si</td>
<td>xssi</td>
</tr>
</tbody>
</table>
- The underlined segments in the first column mark syllable nuclei.
- The period indicates the syllable boundary.
- In the first three verbs, it is the first consonant that is the onset, while in the other three it is the second consonant. By virtue of the rule in (24), in the Imperfective conjugation, the first three verbs geminate the initial consonant and the second three verbs geminate the medial consonant.

Dell & Elmedlaoui’s analysis says nothing about sonorant-less verbs and verbs in which the only sonorant is initial.

(26)  

a.  
bdg > *bbdg  
k*wfs > *kk*wfs  
bzg > *bbzg

b.  
r.kz > *rkkz  
r.qs > *rqqs  
n.gs > *nggs

Dell & Elmedlaoui’s syllable-based analysis fails to explain the reason why:

(i) Verbs in (26) do not undergo gemination in the Imperfective stem
(ii) All verbs that contain at least one sonorant in a non-initial position form their Imperfective by means of gemination. No other verbs behave this way.

(27) Dell & Elmedlaoui (1988:11): “Not all geminable verbs resort to gemination in the Imperfective but most of them do (...) the distribution of the geminating verbs among the geminable verbs seems to be a matter of lexical idiosyncrasy”.

My proposal: the difference between “geminating verbs” and “geminable verbs” is a matter of root structure rather than lexical idiosyncrasy.

(28)

\[ \text{Aorist} \quad \text{Imperfective} \]

a.  
(g(zm)) gzzm « cut »  
(k(ʃm)) kʃʃm « enter »  
(b(ʃr)) bssr « spread out »  
(z(qr)) zggr « cross »  
(b(ʃr)) bddr « mention, evoke »

b.  
(f[r]d) ffrd « nibble »  
(ʃ(kr)z) kkrz « plough »  
(ʃ(kr)f) kkrf « tie up »  
((k^{m})z) kk^{m}z « scratch »  
(ʃ(ʃm)d) ssmd « add »

c.
Observations:
- each verb geminates one consonant in the Imperfective
- the geminated consonant varies from one category of verbs to the other: verbs in (28b) geminate the first consonant while the remaining geminate the second consonant
- the 3rd consonant never geminates
- a sonorant never geminates in the Imperfective, except when it is immediately followed by another sonorant (see examples in (28d))

Among all Berber varieties, Tashlhiyt is the only variety where gemination in the Imperfective is not fixed: it involves either the initial or the medial segment in the root.

(29) Classical Arabic verbal form II

<table>
<thead>
<tr>
<th>Root</th>
<th>form II</th>
<th>Tashlhiyt Berber</th>
<th>Classical Arabic</th>
</tr>
</thead>
<tbody>
<tr>
<td>ktb</td>
<td>kattab</td>
<td>« write »</td>
<td></td>
</tr>
<tr>
<td>kbr</td>
<td>kabbar</td>
<td>« grow up »</td>
<td></td>
</tr>
<tr>
<td>ksr</td>
<td>kassar</td>
<td>« break »</td>
<td></td>
</tr>
<tr>
<td>ūlm</td>
<td>ūllam</td>
<td>« learn »</td>
<td></td>
</tr>
<tr>
<td>ūrb</td>
<td>ẓarrab</td>
<td>« drink »</td>
<td></td>
</tr>
<tr>
<td>ūrf</td>
<td>ẓarraf</td>
<td>« know »</td>
<td></td>
</tr>
</tbody>
</table>

- In Classical Arabic, the template has an essential role in verb derivation. The segmental makeup of the root does not play any part in the derivation. The geminating consonant is always the medial one, regardless of its nature.
- In Tashlhiyt Berber, the Imperfective formation is not templatic: verbs vary as to which of the initial or the medial consonant they geminate. The segmental makeup of the root proves necessary to determine which segment geminates.

(30) The segmental composition of triconsonantal roots

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<td>free composition</td>
</tr>
<tr>
<td>constrained arrangement</td>
<td>free arrangement</td>
</tr>
</tbody>
</table>

| Morphological gemination | variable | fixed |

|---|

9
(31) Geminate the head!

The segment which is geminated in the Imperfective is that segment which is the head of the root

Geminable verbs do not undergo gemination in the Imperfective because they do not have the appropriate internal structure.

(32) Summary

Tashlhiyt Berber triconsonantal verbs are sorted into two groups: (i) those which contain at least one sonorant in a non-initial position and (ii) the others.
- The former undergo gemination in the Imperfective and the others use the prefix tt-
- The distinction between geminating verbs and geminable verbs is shown to follow from the binary branching head-complement structure that the former have but not the others.
- The segment which is geminated in the Imperfective is that segment that is the head of the root
- The head is initial or medial but never final >> as a result >> gemination involves either the initial or the medial segment, but never the final one.

(33) Verbs containing a vowel in a non-final position

<table>
<thead>
<tr>
<th>Verb</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>amz</td>
<td>hold, catch</td>
</tr>
<tr>
<td>anf</td>
<td>avoid</td>
</tr>
<tr>
<td>aws</td>
<td>help</td>
</tr>
<tr>
<td>awk</td>
<td>pull</td>
</tr>
<tr>
<td>awz</td>
<td>stay up, sit up</td>
</tr>
<tr>
<td>als</td>
<td>repeat</td>
</tr>
<tr>
<td>mun</td>
<td>go with</td>
</tr>
<tr>
<td>lul</td>
<td>be born</td>
</tr>
<tr>
<td>rur</td>
<td>give back</td>
</tr>
</tbody>
</table>

What is there in their root?

- Only consonants or consonants as well as vowels: amz < ✓ mz or ✓ amz; anf < ✓ nf or ✓ anf; mun < ✓ mn or ✓ mwn…etc.

(34)

(35) Tri- vs. quadriciconsonantals

<table>
<thead>
<tr>
<th>Aorist</th>
<th>Imperfective</th>
</tr>
</thead>
<tbody>
<tr>
<td>ngd</td>
<td>nggd “drown”</td>
</tr>
<tr>
<td>lb3</td>
<td>lbb3 “crush”</td>
</tr>
<tr>
<td>lq3</td>
<td>lqq3 “grind”</td>
</tr>
<tr>
<td>mfj</td>
<td>mfj “comb”</td>
</tr>
<tr>
<td>rk ”s</td>
<td>rkk ”s “hide”</td>
</tr>
</tbody>
</table>
The structure in (37b) is similar to those that occur in syntactic and syllabic constituencies, where the leftmost element stands for the “specifier” and the rightmost one is defined as the adjunct:

Syntax (Coopman et al. 2003)  syllable (Borowsky 1986, 1989)

XP
/ \          N''
XP  Adjunct  \  |
/ \          / |
Spec   X'     / N'  \\  \\
/ \          / |  \\
X  compl / N   \\
/ \          / |  \\
/ \          / |  \\
/ \          / |  \\
/ \          / |  \\
/ \          / |  \\
/ \          / |  \\
/ \          / |  \\
d e p θ « depth »
References
Borowsky, T. 1986. Topics in the Lexical Phonology of English. PhD, University of Massachusetts, Amherst.