Tashlhiyt Berber triconsonantal roots
A binary branching head-complement structure

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GLOW XXX

(1)

The segmental composition of triconsonantal roots	
Tashlhiyt Berber	*Classical Arabic*
constrained composition ⇓ at least one sonorant in the root	free composition ⇓ voiceless obstruents ex. ✓**kʃf** « discover »
constrained arrangement ⇓ at least one sonorant is preceded by an obstruent	free arrangement ⇓ ✓**lms** « touch » ✓**mrdˤ** « be sick » ✓**mlk** « own »

(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.* ✓**ktb** + **a** > **katab** Active-Perfective, "he wrote"
> — + **u-i** > **kutib** Passive-Perfective "it has been written" root-and-pattern morphology
> — + **i-a** > **kitaab** "book"

Additional arguments: (i) Secret languages (McCarthy 1981): **kattab** > **battak**, **kabbat**, **tabbak**.

(ii) Language disorder and speech errors (aphasia): *e.g.* **ʔiħ-t-imaal** > **ʔiħ-t-ilaam** « probability », **fuqar-aaʔ** > **furaq-aaʔ** « poor », **ma-sbaħ** > **ma-ħbas** « swimming pool » (*cf.* Prunet, Béland & Idrissi 2000).

Hebrew
Concurrence restrictions in Hebrew triconsonantal roots (*cf.* Berent & al. 2004, psycholinguistic evidence, symbolic theory).

(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", **amdlu** "cloud", **imdl** "cap" < ✓**dl**
Galand (2002:81): **amkraz** "ploughman", **tkrizt** "you did not plough"

	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"
tafruxt > **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)

Sources: Boumalk (2003), El Mountassir (2003), Dell & Elmedlaoui (1988).
Loanwords are excluded (*e.g. Cl. Arabic*: **xdm** "work", **fhm** "understand", **ħkm** "judge").

Root	*Verb*	
a.		
✓gzm	gzm	« cut »
✓kʃm	kʃm	« enter »
✓bsr	bsr	« spread out »
✓zgr	zgr	« cross »
✓bdr	bdr	« mention, evoke »
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 »
✓krw	kru	« rent »
✓ʒlw	ʒlu	« 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 **zdɣ** "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 **lmzˤ** "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?
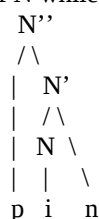
(11) Proposal
      Verbal triconsonantal roots display a binary branching head-complement structure

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.
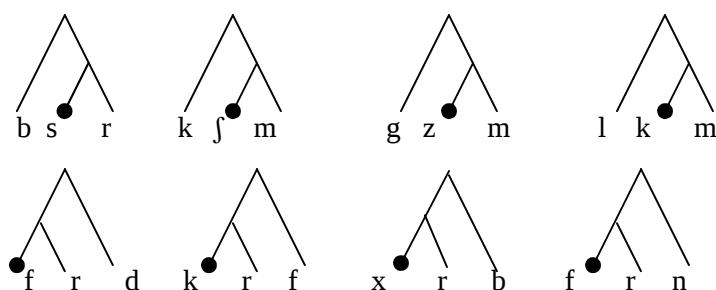
NOTA: On the notions of *Head* and *Complement* and the way they are used in phonological theory, the reader is referred to Dependency Phonology (Anderson 1985, 2002, Anderson & Ewen 1987), Government Phonology (Kaye, Lowenstamm & Vergnaud 1985, 1990) and Metrical Phonology (Hammond 1984, Prince 1985). 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
```
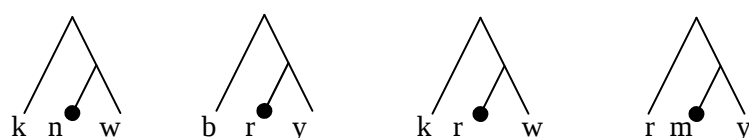
(12) The head and the complement obey 3 conditions
  a. *The head never accommodates a sonorant except when it is followed by another sonorant*
  b. *An obstruent never occurs as the complement*
  c. *The head is immediately on the left of the rightmost sonorant in the root*

(13)   *a. Head obstruent*

    b. Head sonorant

(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).

4

(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"
ʃʃ	"eat"

(17)

C	CC	CCC
O	OS	OOS
	SS	OSO
	SO !	SOS
	OO !	SSS
		OOO ! ⎱
		SSO ! ⎬ *GEM
		SOO ! ⎰ (see sec. VI)

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).

(18)

	Aorist	*Imperfective*	*Preterit*	
a.			*3pms*	*1ps*
"wear"	ls	lssa	lsa	lsi-ɣ
"overnight"	ns	nssa	nsa	nsi-ɣ
"break"	rzˤ	rzzˤa	rzˤa	rziˤ-ɣ
"be sold"	nz	nzza	nza	nzi-ɣ

5

b.

"sleep"	gn	ggan	gn	gn-ɣ
"leave, let"	fl	ffal	fl	fl-ɣ
"fall"	dˤr	ttˤar	dˤr	dˤr-ɣ
"bust"	gl̩	ggal	gl̩	gl-ɣ

c.

"lean"	knu	knnu	kʷna	kʷni-ɣ
"be dirty"	rku	rkku	rka	rki-ɣ
"remove, louse"	zru	zrru	zra	zri-ɣ
"sew"	gnu	gnnu	gʷna	gʷni-ɣ

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 (-ɣ 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:
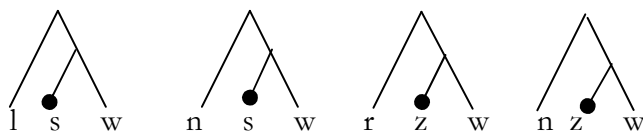
e.g.   **i-nsu** "to overnight" in Snous, Menacer and Ouargla varieties

       i-lsu " to wear" in Ghadames variety,

       i-rzˤu "to break" in Seghroushen, Snous, Menacer, Ouargla and Ghadames varieties

       i-nzu "be sold" in Menacer and Ouargla varieties.

(19)

V. Problematic data
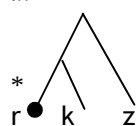
(20) Triconsonantals

    Triconsonantal roots which contradict the analysis are sorted into two types:
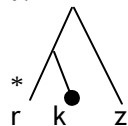
    (i)   Roots in which the only sonorant is initial, as in **rkʷs** "hide", **rkz** "dance" and **nfd** "be stirred up".

    (ii)   Sonorants-less roots such as **bdg** "be wet", **bzg** "swell" and **bxs** "discredit oneself".

6

(21) rkz « dance »

a.   *b.*

r • k z   r • k z

(22) bdg "be wet"

a.   *b.*   *c.*

b d •g   b •d g   b •d g

d.   *e.*   *f.*

b• d g   b• d• g   b• d• g•
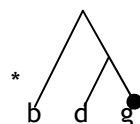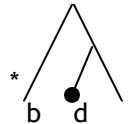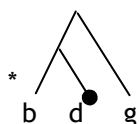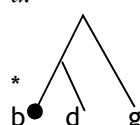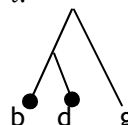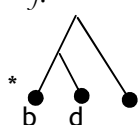
(23) Biconsonantals

	Aorist	*Imperfective*	*Preterit*	
			3pms	*1ps*
a.				
"mill, grind"	$zd^ʕ$	$zzad^ʕ$	$zd^ʕa$	$zd^ʕi$-ɣ
"buy"	sɣ	ssaɣ	sɣa	sɣi-ɣ
"hollow"	ɣz	qqaz	ɣza	ɣzi-ɣ
b.				
"graze"	ks	kssa	ksa	ksi-ɣ
"give"	fk	akka	fka	fki-ɣ

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)

Preterit	Imperfective	
k<u>r</u>z	kkrz	« plough »
x<u>n</u>g	xxng	« strangle »
m<u>r</u>z	mmrz	« wound in the head »
ʒ.b<u>d</u>	ʒbbd	« draw »
ʁ.m<u>l</u>	ʁmml	« mould »
<u>x</u>.s<u>i</u>	xssi	« extinguish »

- 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.
bd̲g > *bbdg
k^wf̲s > *kk^wfs
bz̲g > *bbzg

b.
r̲.kz̲ > *rkkz
r̲.qs̲ > *rqqs
n̲.gs̲ > *nggs

Dell & Elemdlaoui'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)
Aorist   *Imperfective*
a.

(g(zm))	gzzm	« cut »
(κ(ʃm))	kʃʃm	« enter »
(b(s̲r))	bssr	« spread out »
(z(g̲r))	zggr	« cross »
(b(d̲r))	bddr	« mention, evoke »

b.

((f̲r)d)	ffrd	« nibble »
((k̲r)z)	kkrz	« plough »
((k̲r)f)	kkrf	« tie up »
((k̲^wm)z)	kk^wmz	« scratch »
((s̲m)d)	ssmd	« add »

c.

8

(n(d̠ˤr))	nttˤr	« squirt »
(m(g̠r))	mggr	« reap »
(l(k̠m))	lkkm	« arrive »
(n(k̠r))	nkkr	« stand up »
(r(g̠l))	rggl	« knock »

d.

(k(n̠w))	knnu	« lean »
(k(r̠w))	krru	« rent »
(ʒ(l̠w))	ʒllu	« loose »
(b(r̠y))	brri	« scratch »
(k(m̠y))	kmmi	« smoke »

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

Root	*form II*	
ktb	kattab	« write »
kbr	kabbar	« grow up »
ksr	kassar	« break »
ʕlm	ʕallam	« learn »
ʃrb	ʃarrab	« drink »
ʕrf	ʕarraf	« know »

- ❖ 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	
Tashlhiyt Berber	*Classical Arabic*
constrained composition	free composition
constrained arrangement	free arrangement
⇓	⇓
Morphological gemination	
variable	*fixed*

(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
amz	« hold, catch »
anf	« avoid »
aws	« help »
awk	« pull »
awz	« stay up, sit up »
als	« repeat »
mun	« go with »
lul	« be born »
rur	« give back »

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.
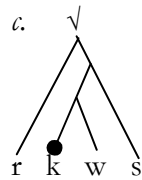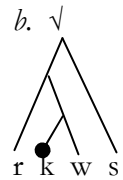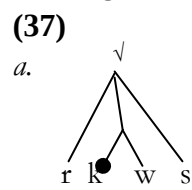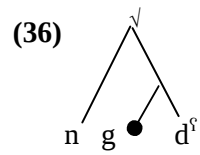
(34)

r w r   m w n   a n f   a w z   a m z
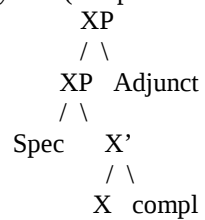
(35) Tri- *vs.* quadriconsonantals

Aorist	Imperfective	
ngdˤ	nggdˤ	"drown"
lbʒˤ	lbbʒˤ	"crush"
lqʒˤ	lqqʒˤ	"grind"
mʃdˤ	mʃʃdˤ	"comb"
rkʷs	rkkʷs	"hide"

(36)

```
        √
       /|\
      / | \
     n  g • dˤ
```

(37)

a.

```
        √
       /|\
      / | \
     r k• w s
```

b.

```
    √
   /|\
  / | \
 r k• w s
```

c.

```
    √
   /|\
  / | \
 r k• w s
```
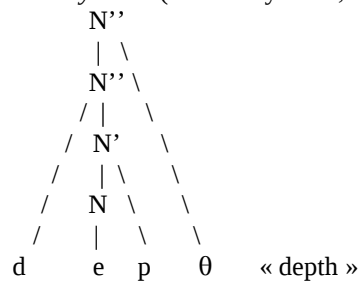
The structure in (37b) is similar to those that occur in syntactic and syllabic constituencies, where the leftmost element stands for the "specifier" and the rightmost one is defined as the adjunct:

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

```
      XP                        N''
     / \                        | \
   XP   Adjunct                 N'' \
   / \                         / |   \
 Spec   X'                    /  N'   \
       / \                   /  /| \   \
      X   compl             /  N \  \   \
                           / / | \  \   \
                          d  e  p  θ    « depth »
```

References

Anderson, J. 1985. « Structural analogy and dependency phonology ». *Acta Linguistica Hafniensia* 19: 5-44.

Anderson, J. 2002. *A Notational Theory of Syntactic Categories. Cambridge Studies in Linguistics* 82, Cambridge University Press.

Anderson, J. & Ewen, C. 1987. *Principles of Dependency Phonology*. Cambridge University Press.

Aronoff, M.: 1976. *Word Formation in Generative Grammar*. MIT Press, Cambridge, Massachusetts.

Berent, I., Vaknin, V. & Shimron, J. 2004. "Does a theory of language need a grammar? Evidence from Hebrew root structure". *Brain and Language* 90: 170-182.

Boumalk, A. 2003. *Manuel de conjugaison du tachelhit (langue berbère du Maroc)*. Paris: L'Harmattan.

Borowsky, T. 1986. *Topics in the Lexical Phonology of English*. PhD, University of Massachusetts, Amherst.

Borowsky, T. 1989. "Structure Preservation and the Syllable Coda in English". *Natural Language and Linguistic Theory* 7: 145-166.

Cantineau, J. 1950. Racines et schèmes. *Mélanges William Marçais*, Paris, Maisonneuve.

Copman, H., Sportishe, D. & Stabler, E. 2003. *An Introduction to Syntactic Analysis and Theory*. Ms, UCLA.

Dell, F. & M. Elmedlaoui. 1988. Syllabic Consonants in Berber: Some New Evidence. *Journal of African Languages and Linguistics* 10, 1-17.

DELL, F. & ELMEDLAOUI, M. 1991. « Clitic Ordering, Morphology and Phonology in the Verbal Complex of Imdlawn Tashelhiyt Berber ». *Langues Orientales Anciennes Philologie et Linguistique*, 3: 77-104.

Dell, F. & M. Elmedlaoui. 2002. *Syllables in Tashlhiyt Berber and in Moroccan Arabic*, Dordrecht, Kluwer Academic Publishers.

Diakonoff, I. M. 1970. Problems of Root Structure in Proto-Semitic. *Archiv Orientalni*, 38.453-80.

Diakonoff, L. M. 1988. *Semitico-Hamitic Languages. Afrasian Languages*. Moscou.

Elmedlaoui, M. 1994. Extension de la racine chamito-sémitique. *Linguistique Africaine* 12: 93-118.

El Mountassir, A. 2003. *Dictionnaire des verbes tachelhit-français (parler berbère du sud du Maroc)*. L'Harmattan. Paris.

Galand, L. 1988. « Le berbère, Les langues dans le monde ancien et moderne ». *Les langues chamito-sémitiques*, Paris, CNRS.

Iazzi, E. 1992. *Morphologie du verbe en tamazight (parler des Aït Attab, Haut Atlas Central): approche prosodique*. Université Mohamed V, Thèse de D.E.S.

Jebbour, A. 1996. *Morphologie et contraintes prosodiques en berbère (tachelhit de Tiznit) : analyse linguistique et traitement automatique.* Thèse de Doctorat d'Etat, Université Mohamed V, Rabat.

Hammond, M. 1984. *Constraining metrical theory: a modular theory of rhythm and destressing*. Doctoral dissertation, UCLA.

Kaye, J., Lowenstamm, J. & Vergnaud, R. 1985. « The Internal Structure of Phonological Elements: a Theory of Charm and Government ». *Phonology Yearbook* 2: 305-328.

Kaye, J., Lowenstamm, J. & Vergnaud, R. 1990. « Constituent Structure and Government in Phonology ». *Phonology Yearbook* 7/2: 193-231.

Kanye, R. 1994. The Antisymmetry of Syntax. MIT Press. Cambridge. Massachusetts.

Kossmann, M. 2000. *Esquisse grammatical du rifain oriental*. Peeters. Paris-Louvain.

Levin, J. 1985. *A metrical theory of syllabicity.* PhD, MIT, Cambridge, Massachusetts.

Louali, N. & Philippson, G. 2003. Le thème de l'aoriste intensif : formes multiples, contenu unique. *Collection d'articles 2ème Bayreuth Frankfurter Kolloquium zur Berberologie (9-13 juillet 2002)*. Berber Studies. Rüdiger Köppe Verlag;

McCarthy, J. 1981. « A Prosodic Theory of Nonconcatenative Morphology ». *Linguistic Inquiry* 12/3.

McCarthy, J. 1991. « L'infixation réduplicative dans les langages secrets ». *Langages* 101, p. 11-29.

Prince, A. 1985. « Improving tree theory ». M. Niepokuj, M. VanClay, V. Nikiforidou & D. Jeder (eds.), *Proceedings of Berkeley Linguistic Society* 11: 471-490.

Prunet, J-F., Béland, R. & Idrissi, A. 2000. « The Mental Representation of Semitic Words ». *Linguistic Inquiry* 31/4: 609-648.

Spencer, A. 1991. *Morphological Theory*. Blackwell, Oxford.