LANGUES ORIENTALES ANCIENNES PHILOLOGIE ET LINGUISTIQUE

N° 3 / 1991

EXTRAIT

PEETERS
LOUVAIN - PARIS

LOAPL 3 (1991), 77-104

CLITIC ORDERING, MORPHOLOGY AND PHONOLOGY IN THE VERBAL COMPLEX OF IMDLAWN TASHLHIYT BERBER

PART II

F. DELL
(C.N.R.S., Paris)

M. ELMEDLAOUI
(Université Mohamed I, Oujda)

8. THE MORPHOLOGY OF PRIMARY VERBAL BASES

The rest of this article deals with the structure of verbal stems in ITB. Our intent is not to provide a complete description which would enable one to derive all the well-formed verbal forms built on any verbal root of ITB, a task which would require a book. We believe, however, that our description gives an accurate enough picture of the overall pattern of stem formation in ITB. Further work will no doubt bring to light new regularities pertaining to particular classes of verbs, or restrictions on the possible types of idiosyncrasies and on their distribution in the lexicon, but we are confident that it will not substantially alter the general picture arrived at here. Our general outlook is that of generative phonology, but many of our "rules" would more appropriately be called empirical generalizations. Things will have to

remain in this unsatisfactory state until we gain comparable factual knowledge about the morphology of nouns, which resorts to processes rather similar to those at work in verbs.

In the table below we give the four stems of the verb *lsa* "wear (clothes)" (a), and of three verbs derived from it: a reciprocal verb (b), a causative verb (c) and a passive verb (d).

(97)	I	II	III	IV
	pf	neg	aor	impf
a	lsa	lsi	ls	lssa
b	mm-lsa	mm-lsi	mm-ls	tt-mm-lsa
c	ss-lsa	ss-lsi	ss-ls	ss-lsa
d	tt-yawlsa	tt-yawlsa	tt-yawlsa	tt-yawlsa

Let us use the term "base" to refer to the unit which underlies four stems belonging to the same line. For instance, we shall say that the four forms in (97)b are the four stems of the base *mm-lsa* "wear one another's clothes". We shall call primary those bases which, like *lsa* in (97)a, are merely comprised of a root; the others will be called secondary bases. Whereas the four stems of a given base share the same argument structure, two different bases sharing the same verbal root have different argument structures. Together with the imperfective prefix /tt/, the prefixes which are used to form secondary bases will be called augments. As illustrated in (97)b-d, ITB can form three types of secondary bases: reciprocal bases (augment /mm/), causative bases (augment /ss/) and passive bases (augment /tt/)[53]. Processes of secondary base formation may operate on inputs which themselves are secondary bases, as when the reciprocal base *mm-s-lsa* "dress one another" is derived by prefixing the reciprocal augment /mm/ onto the causative base *ss-lsa* "dress" in (97)c. Such combinations are subject to the following restrictions: passive bases cannot be inputs to any further secondary derivation; reciprocal bases can be inputs to causative formation, but not to reciprocal or passive formation; causative bases can be inputs to reciprocal formation and to passive formation, but it is not clear at the moment whether they can be inputs to causative formation. We have not been able to find acceptable bases involving more than three successive secondary derivations, and it has yet to be determined whether this limitation is inherent to the morpho-syntactic structure of ITB, or whether it is simply due to performance limitations of the sort discussed in Chomsky (1965: 10 ff.).

Here are for instance the acceptable bases formed on the transitive verb *ħada* "be next to". In the left margin, V, R, C and P respectively stand for "primary base", "reciprocal", "causative" and "passive". The systematic homophony of stems I, II and III in (98) does not reflect a general property of ITB. It is due to the particular verb used as an example.

[53] The augments are subject to various alternations, cf. section 9.

(98)		I	II	III	IV
		perfective	negative	aorist	imperfective
a	V	ħada	ħada	ħada	ttħada
b	RV	mħada	mħada	mħada	ttmħada
c	CV	sħada	sħada	sħada	sħada
d	PV	ttyawħada	ttyawħada	ttyawħada	ttyawħada
e	CRV	smħada	smħada	smħada	smħada
f	RCV	mmsħada	mmsħada	mmsħada	ttmmsħada
g	PCV	ttyawsħada	ttyawsħada	ttyawsħada	ttyawsħada
h	PCRV	ttyawsmħada	ttyawsmħada	ttyawsmħada	ttyawsmħada

We give below one sentence to exemplify each base in (98). All verbs are in the perfective.

(99)a i-ħada ugrtil !tazrbiyt
3ms-next mat:c carpet
the mat is next to the carpet [54]

(99)b m-ħada-n igrtal
rec-next-3mp mats:c
the mats are next to one another

(99)c i-s-ħada ħmad !agitun-nn-s i wasif
3ms-caus-next Ahmed tent-of-3s dat river:c
Ahmed put up his tent next to the river

(99)d ur i-ttyaw-ħada uγuzi-nn-k
neg 3ms-pass-next plot:c-of-2ms
there is nothing adjoining your plot of land ("it is not adjoined")

(99)e i-s-m-ħada urgaz igrtal
3ms-caus-rec-next man:c mats
the man put the mats next to one another

(99)f mm-s-ħada-n irgazn !igutan
rec-caus-next-3mp men:c tents
the men put up their tents next to one another

(99)g i-ttyaw-s-ħada ugrtil i !tzrbiyt
3ms-pass-caus-next mat:c dat carpet:c
someone put the mat next to the carpet

(99)h ttyaw-s-m-ħada-n igrtal
pass-caus-rec-next-3mp mats:c
someone put the mats next to one another

[54] *Agrtil* "mat" is a masculine noun. *!tazrbiyt* is a direct object.

Many secondary bases must be listed independently in the lexicon since they have meanings which are not entirely predictable from the corresponding primary bases. For instance, alongside the completely predictable meaning "dress" (i.e. cause to wear), the causative *ss-lsa* of (97)c also has another one, viz. "grow down (young birds)". Or again the passive *tt-ut*, from *ut* "strike", can also mean "rot (fruit, vegetable)".

The rest of section 8 is devoted to a presentation of the various ways in which verbal bases form their four stems; that presentation focusses on primary bases, but many of the generalisations arrived at remain valid for secondary bases, which will be dealt with in section 9. The facts about the morphology of the secondary bases are of help in trying to understand the behavior of primary bases: comparing the four stems of secondary bases with those of primary bases enables us to sort out those morphological processes which operate in all bases from various local subregularities which obscure the pattern in primary bases.

8.1. *Perfective and aorist stems*

When studying the formal relationships between the four stems of an ITB verb it is convenient to take stem I as a starting point. Except when stated otherwise, the negative, aorist and imperfective of a given base will be derived from that base's perfective stem. For the sake of brevity, we shall occasionally write about the properties of a certain base, while actually meaning to refer to the properties of that base's stem I. We may for instance write about "verbs ending in *i*", intending to refer to the verbs whose stem I ends in *i*. The categories labelled I, II, III and IV will at times be referred to as stem classes.

We will first discuss the three PERFECTIVE stems. Their description is a prerequisite to the presentation of stem IV.

Stems I, II and III do not use affixation. Except for idiosyncrasies concerning particular verbs, the differences between these three stems are all located in the radical vowels. The main differences involve alternations affecting final *a*'s and initial high vocoids.

8.1.1. Alternations involving final *a*

No matter which of the four stem classes it may belong to, a given stem remains invariant when it is conjugated for the various PNGs[55]. There is however one important exception: in the perfective of many verbs the final *a* is obligatorily replaced by an *i* in the first and second persons in the singular. An example is the conjugation of *lsa*'s stem I.

[55] We are setting aside alternations caused by the general phonological processes of ITB, such as syllabification or voicing assimilation.

(100)

	singular	plural
1	lsi-x	n-lsa
2m	t-lsi-t	t-lsa-m
2f	idem	t-lsa-mt
3m	i-lsa	lsa-n
3f	t-lsa	lsa-nt

Only stems I ever show alternations which depend on the PNG. Furthermore such alternations are always of the type exemplified in (100): the stem has one variant in the 1s and 2s, and another when occurring with the other PNGs. This type of alternation, which will henceforth be referred to as the 1s2s ablaut, is only found in a subset of the stems with a final *a*. The 1s2s ablaut goes hand in hand with another alternation: in any base whose final *a* is subject to the 1s2s ablaut in stem I, the final *a* is replaced by an *i* in the negative stem, and conversely, if a given base's final *a* is changed into an *i* in the negative, that base is subject to the 1s2s ablaut in the perfective. The table below shows the various subclasses of verbal bases with a final *a* and gives an example of each. *a/i* indicates the 1s2s ablaut. Stems IV, which are irrelevant for the time being, are given in order to allow subsequent reference [56].

(101)

			I	II	III	IV
a		detachable	lsa/i	lsi	ls	lssa
b	variable	mutable	fda/i	fdi	fdu	tt-fdu
c			u33a/i	u33i	a33i	tt-a33i
d			ura/i	uri	ara	tt-ara
e	invariable		wala	wala	wala	tt-wala

a is the only stem final segment which varies when one moves from stem I to stem II or stem III.

We will call variable *a* verbs those which are subject to the 1s2s ablaut in stem I and have a final *i* in stem II (lines a to d in (101)); the other verbs with a final *a* (line e) will be called invariable *a* verbs. The various classes of variable *a* verbs differ in their behavior in the aorist. Those which lose their vowel in the aorist (line a) will be called detachable *a* verbs, and the others (lines b to d), mutable *a* verbs. Almost all mutable *a* verbs have a final *u* in the aorist (line b; these will be referred to as the *a/u* verbs, or the regular mutable *a* verbs). The classes exemplified in lines c and d contain only a handful of verbs.

Verbs ending in *a* have a variable *a* unless they have the form C_1aC_1a, in which case they have an invariable *a*. For instance the final *a* is invariable in *wala*, *ngara*,

[56] The verbs in (101) have the following meanings: (a) "wear", (b) "buy back", (c) "let", (d) "write", (e) "follow".

mnassa, *s-naħya*[57], whereas it is variable in *nda*, *ħudda*, *buyla*, *ttulwa*[58]. On the other hand it does not seem possible to predict which ones of the variable *a* verbs fall into the detachable *a* class, and which ones fall into the mutable *a* class. Assuming all the variable *a* verbs to have a final /a/ in their underlying representations, the grammar of ITB must contain a rule which drops a final /a/ in the aorist, and another rule which rewrites final /a/ as a high vocoid in stems III and IV. The lexical entries of the four classes of variable *a* verbs must therefore be distinguished from one another by diacritic features. From now on, when we wish to indicate that a verb has a detachable *a*, we enclose its final vowel between parentheses, and when we wish to indicate that it is a regular mutable *a* verb, we write a hyphen before its final vowel. According to these conventions the verb in (101)a will be given as *ls(a)* and that in (101)b as *fd-a*.

From now on the 1s2s ablaut of perfective stems will not be indicated when we list the four stems of a verb, since it is predictable: all and only the variable *a* verbs are subject to it.

8.1.2. Alternations involving initial vocoids

In stems with an initial vocoid that vocoid may be *i*, *u* or *a* in perfective and negative stems, but it can only be /a/ in aorist stems[59]:

(102)	I	II	III	IV
a	aywul	aywul	aywul	tt-aywul
b	uzn	uz(i)n	azn	tt-azn
c	ull	ull	all	tt-all
d	iwi	iwi	awi	tt-awi

Let us posit a rule which rewrites as *a* any syllabic vocoid occurring at the beginning of a stem III radical[60].

(103)

$$\text{A-INI:} \qquad [-\text{cons}] \longrightarrow a \;/\; {}_{\text{AOR}}[\;\underset{}{\overset{\overset{\text{N}}{|}}{\text{—}}}$$

The rule must not affect initial *w*'s, as illustrated in (101)e-III[61], hence the requirement that the initial vocoid be dominated by a node labelled N(ucleus).

[57] Meaning respectively "follow", "miss", "be half empty" and "distinguish".

[58] Meaning respectively "churn", "be bounded", "be green and full of sap", and "be loose". Many verbs of the form *KC:a* have two conjugations in free variation, one with an invariable *a* and the other as *a/u* verbs. Such is for instance the case of *bqqa* "remain" and *ħiya* (underlying /ħyya/) "be magnificent". In the expression *KC:a* the symbol *C:* represents a geminate *C*, and in general, in what follows, *X:* represents a geminate of type *X*.

Whereas there are C_iaC_ia and C_iuC_ia verbs, we have been unable to find any verb of the form C_iiC_ia.

[59] The verbs in (102) have the following meanings: (a) "be tall", (b) "send", (c) "hoist", (d) "take away".

[60] There are a few exceptions, e.g. *ut* (aor. *ut*) "strike", *uff* (aor. *uff*) "swell", *itti* (aor. *itti*) "go far".

[61] We have not encountered any primary base with initial *y*.

A base can have alternations both in its final *a* and in its initial *u*:

(104)	I	II	III	IV
a	ufa	ufi	af	tt-afa
b	uza	uzi	azu	tt-azu

ufa "find" has a detachable *a*; *uza* "skin" is an *a/u* verb.
Alternations involving final *a*'s and initial vocoids are the two processes which regularly operate in the formation of aorist stems. When a base does not meet the conditions of either one, its aorist stem is identical with its perfective stem [62].

8.2. *Negative stems*

Predicting the form of a given base's negative stem from that of its perfective stem is a rather simple matter. One must distinguish three cases, depending on whether the perfective stem

(105) a. ends in a contoid which is immediately preceded by a contoid or by a nonsyllabic vocoid,
b. ends in a variable *a*,
c. does not fall under cases a or b.

In the first case the negative stem has two free variants; one is identical with the perfective stem and the other is derived from it by inserting the vowel *i* before the final contoid [63]. This is illustrated below [64].

(106)				
a. dl	d(i)l	b. ukz	uk(i)z
c. qqn	qq(i)n	d. !ʃawr	!ʃaw(i)r
e. skr	sk(i)r	f. a:yyn	a:yy(i)n
g. rwl	rw(i)l	h. ddukkl	ddukk(i)l
i. !duwr	!duw(i)r	j. qiyd	qiy(i)d
k. !ddurdr	!ddurd(i)r	l. ħʃʃm	ħʃʃ(i)m

In case b, as explained in section 8.1.1., the negative stem is derived by replacing the final *a* of the perfective stem by an *i* [65]:

[62] Aorist formation also resorts to various processes which only operate in a sporadic manner, such as the following: (a) the replacement of *u* by *a* in C_1uC; (b) the replacement of a final *a* by *i*; (c) the appearance of an initial *i*; (d) the insertion of a vowel before the final contoid; (e) the degemination of a consonant. In the following pairs the first member is a perfective stem, and the second the corresponding aorist stem. *drus/idras* "be few", *lur/lar* "give back", *la/ili* "have", *ra/iri* "want", *!wrrɣ/!iwriɣ* "be yellow", *ssn/issan* "know", *nna/ini* "say", *ggut/igat* "be numerous", *!zzay/!izay* "be heavy".

[63] We have found a few verbs where *i* cannot be inserted in the negative, e.g. *ggiwr* "sit", *zayd* "add", *!mmadrs* "die in such a manner as to be unfit for consumption (animal)", *ffɣ* "get out".

[64] The meanings of the verbs in (106) are (a) "cover", (b) "recognize", (c) "castrate", (d) "take advice", (e) "do", (f) "recognize", (g) "flee", (h) "take as a friend", (i) "put around", (j) "record", (k) "be deaf", (l) "be ashamed".

[65] The meanings of the verbs in (107) are (a) "be, put", (b) "come", (c) "have a wide mesh", (d) "be cool".

(107) a. ga gi b. uʃka uʃki
c. zzurra zzurri d. zuzwa zuzwi

Finally, in case c, the negative stem is identical with the perfective stem. This case concerns all those verbs which end in an invariable *a*, an *i*, an *u*[66], and all those in which the penultimate segment is a syllabic vocoid. Here are examples of such stems[67].

(108) a. mun b. !γar c. !ksud d. msar
e. ffu f. uru g. ldi h. ʒara
i. faw j. ut

8.3. *Imperfective stems*

Some of the processes involved in the derivation of imperfective stems also operate in that of aorist stems, whereas others only operate in the imperfective. Setting aside the fact that detachable *a*'s do not drop in the imperfective (cf. (101)a and (104)a), an imperfective stem always has the same vowels as the corresponding aorist stem; cf. (101)b-c, (102)b-c, (104) and the examples below.

(109)

	I	III	IV	
a	iws	aws	tt-aws	"help"
b	!uda	!adu	tt-!adu	"bend"
c	drus	idras	tt-idras	"be few"
d	nna	ini	tt-ini	"say"
e	!wrrγ	!iwriγ	tt-!iwriγ	"be yellow"
f	zzurra	zzurri	tt-zurruy[68]	"have a wide mesh"
g	!zzulla	!zzall	tt-!zalla	"pray"

Stems III in (109)a-b are accounted for by rule (103); the one in (109)b is furthermore subject to the final *a*/*u* mutation. The other aorists in (109) are subject to various sporadic processes mentioned in note 62. When one of these processes operates in the aorist stem of a given base it also operates in the corresponding imperfective stem.

The following three processes are used in forming imperfective stems: the prefixation to the radical of a /tt/ augment, the gemination of one of the segments in the radical, and the insertion of a vowel in the radical. Let us examine them in turn.

[66] We have been able to find only three stems ending in *u*: *ffu*, *ttu* and *uru*, which respectively mean "be daylight", "forget" and "give birth".

[67] The meanings of the verbs in (108) are (a) "gather", (b) "run", (c) "be afraid", (d) "chase away", (e) "be daylight", (f) "give birth", (g) "pull", (h) "seek", (i) "be lit", (j) "strike".

[68] This verb can also be conjugated as a regular *a*/*u* verb, in which case its aorist is *zzurru* and its imperfective, *tt-zzurru*.

8.3.1. *The augment /tt/*

Examples of the imperfective augment /tt/ can be found in column IV in (101), (102), (104) and (109). Let us posit the following rule.

(110) TT: in stem IV, prefix /tt/

8.3.2. *Gemination*

By a geminated stem IV we mean an imperfective stem which contains a geminate whose reflex in the corresponding stem I is not a geminate. Examples are the imperfectives *kkrf* and *rgg^{o}l*, whose corresponding stems I are *krf* and *rwl* (meaning respectively "tie up" and "flee")[69]. Here are examples of bases which use gemination in the imperfective[70].

(111)		I	IV		I	IV
	a	dl	ddal	b	ks(a)	kssa
	c	mrz	mmrz	d	gr-a	grru
	e	xng	xxng	f	msx	mssx

Although it is not possible to predict for any verbal base whether it undergoes gemination in the imperfective, one can give conditions which a base must necessarily meet if it is to be subject to gemination. Furthermore, given that a base has a geminated stem IV, one can always predict which one of its segments is subject to gemination. Let us examine these questions in turn.

If a verbal base is to be subject to gemination in the imperfective it must:

(112) (a) be a primary base
(b) contain no more than three segments
(c) not contain any geminate (in stem I)
(d) not contain syllabic vocoids in nonfinal position.

Here are bases which violate one of the conditions in (112) (here and below the forms given in parentheses are the corresponding imperfective stems). Condition (a): *m-smkl (tt-m-smkal)*; condition (b): *smsr (smsar)*; condition (c): *qqn (tt-qqn)*, *zza (tt-zzu)*, *bdd (tt-bdad)*, *ħbbl (tt-ħbbal)*; condition (d): *!udn (tt-!adn)*, *!ud-a (tt-!adu)*, *mun (tt-mun)*, *γab (tt-γab)*[71]. Cases *a* and *b* in table (119) give a complete inventory of the types of bases which meet conditions (112)[72].

Condition (d) simultaneously takes into account the feature content of segments (it refers to the value of the feature [cons]) and their location within syllables (it

[69] The geminated reflex of *w* in the imperfective is always *gg^{w}*; those of *γ*, *γ^{w}* and *!d* are respectively *qq*, *qq^{w}* and *!tt*. Cf. Elmedlaoui (1985).

[70] The meanings of the verbs in (111) are (a) "cover", (b) "pasture", (c) "be wounded in the head", (d) "pick up", (e) "strangle", (f) "transform".

[71] The meanings of these verbs are (a) "do housework for one another"; (b) "persecute"; (c) "castrate", "happen", "stand up", "clasp"; (d) "fall ill", "bend", "gather", "be absent".

[72] We have not found any base of the form *Ku* or *KKu*.

refers to syllabicity). It is not possible to reformulate that condition so as to refer to one only of these two factors. Among the verbs which meet conditions (a)-(c) and which contain a nonfinal vocoid, none of those where the vocoid in question is syllabic has a geminated stem IV, cf., e.g., *iwn (tt-awn)*, *duy (tt-duy)*, *sul (tt-sul)*, but some of those where that vocoid is nonsyllabic undergo gemination in the imperfective, as for instance *zwi (zgg^{o}i)*, *rwl (rgg^{o}l)*. On the other hand condition (d) cannot be reformulated so as to prohibit gemination in the imperfective of all the verbs which contain a syllable peak in nonfinal position, for as a result it would incorrectly prohibit it in all those verbs where the syllabic peak in question is a contoid, as in *!ħrf (!ħħrf)*, *rgm (rggm)*, *rwl (rgg^{o}l)*, which respectively syllabify as *(!ħr'f)*, *(r') (gm')* and *(r') (wl')* [73].

Given that a base has a geminated stem IV, it is possible to predict which one of its segments undergoes gemination in terms of its syllabic structure (i.e. of that of its stem I). Imperfective gemination is effected according to the following rule.

(113) GEM: in a verb base which satisfies (112), geminate that segment which is a syllable onset.

Syllabification in ITB was discussed in our 1985 article and in Elmedlaoui (1985). It was proposed in those works that in ITB the mechanisms which syllabify a string operate in two stages. During the first stage an algorithm CS (for Core Syllabification) builds core syllables. Core syllables consist of a nucleus (one segment) preceded by an onset (one segment), except at the beginning of a syllabification domain, where some core syllables have no onset. Any segment, even a voiceless stop, may become a nucleus. During the second stage segments not yet syllabified are attached to neighboring syllables and various readjustments give rise to complex onsets and complex codas. For instance the strings /t-rks/ (3fs-hide:pf) and /rks-nt/ (hide:pf-3fp) are parsed as *(tr') (ks')* and *(r')k(sn')t* by CS in the first stage, and they end up as *(tr'ks)* and *(r'k) (sn't)* at the end of the second stage. (113) refers to the syllable onsets which appear in the incompletely syllabified representations produced by the operation of CS on the perfective stems taken in isolation. A detailed discussion of CS can be found in the references to our work given above. As for (113), its full justification is given in Dell and Elmedlaoui (1988), and here we shall content ourselves to illustrate it with a few examples [74].

[73] Parentheses enclosing a sequence indicate that all its elements belong to the same syllable, and an apostrophe indicates that the preceding element is associated with a nucleus: *(a'c)(ti')(vi'st)*. Here are the meanings of the verbs mentioned in the paragraph above: *iwn* "climb", *duy* "be awake", *sul* "still be alive", *zwi* "shake down (fruit)", *rwl* "flee", *!ħrf* "be smart", *rgm* "insult".

[74] The verbs in (114) have the following meanings: (a) "sort out", (b) "peel", (c) "be wounded in the head", (d) "strangle", (e) "rot", (f) "mold", (g) "leap", (h) "enter", (i) "squash", (j) "hide", (k) "drown", (l) "rejoice".

(114)	I	IV		I	IV		I	IV
a.	frn	ffrn	e.	rkm	rkkm	i.	!lbʒ	!lbbʒ
b.	!zlm	!zzlm	f.	γml	γmml	j.	rks	rkks
c.	mrz	mmrz	g.	!ndr	!nttr	k.	!ngd	nggd
d.	xng	xxng	h.	kʃm	kʃʃm	l.	rʃq	rʃʃq

Let us call the three segments *X*, *Y* and *Z*. In the perfective stems of (114)a-d the syllabic structure yielded by CS is *(XY')Z* (e.g. *(fr')n* in (114)a), with *X* in onset position, and it is *X* which is geminated in the imperfective. In (114)e-l on the other hand, the operation of CS in the perfective stem yields the syllabic structure *(X')(YZ')* (e.g. *(r')(km')* in (16e), with *Y* in onset position, and it is *Y* which is geminated in the imperfective.

Since an onset must always be followed by a nucleus, (113) implies that there does not exist any verb where imperfective gemination affects the last segment, which is correct. Given (112)b and the fact that ITB has no bases with only one segment, the bases with a geminated stem IV contain two or three segments. In the two segment bases the segment geminated in the imperfective is always the first, as predicted by CS[75]. The bases containing three segments belong to the following types: *KKK*, *KKV*, *KGV* and *KGK* (*G* stands for a semivowel). In those of type *KKK* a syllable onset may occur in first or in second position, depending on the particular consonant sequences they are comprised of. This has already been illustrated above. In the three other types on the other hand it is always the second segment which is syllabified as an onset, and it is precisely that segment which is always geminated in the imperfective, as predicted by (113). Here is one example for each type: *fta (fttu)* "go away", *rwi (rgg^{o}i)* "mix", *rwl (rgg^{o}l)* "flee".

In certain roots subject to (113) an initial labial (*b*, *f* or *m*) becomes *a* in the imperfective, as for instance in *msl (assl)* "plug", *bd-a (addu)* "begin", *fk(a) (akka)* "give"). There are exceptions, e.g., *fs-a (fssu / *assu)* "open out (flower)", *!mdi (!mtti / *!atti)* "taste".

8.3.3. *The chameleon vowel*

Here are examples of verbs which are subject to vowel insertion in the imperfective[76].

(115)	III	IV		III	IV
a	!ħadr	tt-!ħadar	b	knunni	tt-knunnuy
c	skkiws	tt-skkiwis	d	fl	ffal

[75] Here is a list of all the two segment bases of ITB which satisfy (112) and have a geminated stem IV: *!di (!ttay)* "take out", *dl (ddal)* "cover", *!dr (!ttar)* "fall", *fl (ffal)* "leave", *g(a) (tt-gga)* "be", *γ^{o}i (qq^{o}ay)* "seize", *gn (ggan)* "sleep".

[76] The verbs in (115) have the following meanings: (a) "be present", (b) "be round", (c) "sit", (d) "leave", (e) "change", (f) "graze", (g) "feel sick".

e	bddl	tt-bddal	f	sli	slay
g	mmuylt	tt-muylut [77]			

The vowel is always inserted between the last two segments. Its quality is the same as that of the preceding vowel, if there is one (cf. a, b, c, g). Otherwise it is *a* [78]. Let us call the inserted vowel a chameleon. In order to be susceptible to chameleon insertion a base must meet the following conditions:

(116) a. it must not have an invariable *a*
b. its penultimate segment must not be a syllabic vocoid
c. it must not be of the form *Y:Z* (*Z* a single segment)
d. it must not begin with a syllabic vocoid
e. if it is a primary base, it must not have a mutable *a*.

Whereas condition a has no exceptions, condition b has a few [79]. Since secondary bases cannot be comprised of a geminate followed by a single segment, nor can they begin with a vocoid, conditions c and d in effect concern only the primary bases, as does condition e. Here are examples of bases which each violate one of the conditions in (116) (their imperfective stems are given between parentheses): (a) *ħada (tt-ħada)*; (b) *zul (tt-zul)*; (c) *kk°m (tt-kk°m)*; (d) *urm (tt-arm)*; (e) *xf-a (tt-xfu)* [80]. Let us posit the following rule.

(117) CHAM: In the imperfective, insert a chameleon before the last segment of any base meeting all the conditions in (116).

To be a possible input to CHAM, a base must meet yet another condition besides those in (116): it must not contain a geminate resulting from the operation of the rule GEM. In (118) the forms on the left illustrate the fact that a chameleon is regularly inserted in bases with a lexical geminate, whereas those on the right illustrate the fact that insertion is prohibited in bases which are subject to GEM [81].

(118)	I	IV		I	IV
a.	!ʒggr	tt-!ʒggar	b.	zgr	zggr
c.	frrd	tt-frrad	d.	frd	frrd
e.	fssr	tt-fssar	f.	fsr	assr

[77] In most verbs of the form *K:X*, where *X* stands for a sequence comprised of at least two segments, the initial segment degeminates if it follows an augment.

[78] This sentence does not take into account the existence of a subset of stems marked [+D] (cf. section 8.3.4), where under certain circumstances the inserted vowel is *u*.

[79] These are a few bases of the form *KuK*, for instance *luħ* "throw", whose imperfective stem can be either *tt-luħ* or *tt-lwaħ*.

[80] These verbs have the following meanings: (a) "adjoin", (b) "go through", (c) "crush with a pestle", (d) "try", (e) "be unrecognizable".

[81] There exist a few exceptional imperfective stems where GEM and CHAM both operate; on these cf. (119)a. The verbs in (118) have the following meanings: (a) "disturb", (b) "cross", (c) "give small change", (d) "graze", (e) "explain", (f) "spread".

Whereas the conditions in (116) pertain to information contained in the representations which are inputs to CHAM, barring CHAM from applying to stems which have undergone GEM has to do with the way the morphological component organizes the interaction between rules.

8.3.4. *A survey of the imperfective stems in primary bases*

Now that we have characterized the regular processes operating in the formation of imperfective stems let us present an overall view of stem IV formation in the primary bases of ITB.

GEM, TT and CHAM each operate alone in certain bases. Such is the case for GEM in (101)a, for TT in (101)b-e and for CHAM in (115)f. There are also bases which simultaneously undergo two of these rules. CHAM thus co-operates with GEM in (111)a and (115)d, and with TT in (115)a-c. On the other hand TT and GEM can never co-operate [82], and consequently there are no cases where all three rules simultaneously operate in the same imperfective stem. Whereas TT and CHAM are found to operate in secondary bases as well as in primary ones, GEM can only operate in primary bases (cf. (112)a).

By examining the phonological make up of any primary base one can determine whether the base in question belongs to the set of those whose stem IV can be predicted unambiguously. Moreover for those bases which do not belong to that set and which accept several forms in free variation in the imperfective stem (cf. below), the morphological structure of ITB precisely delimits the range of options from which lexical idiosyncrasy selects. Table (119) represents the various options used in the formation of the imperfective stems of the primary bases, together with canonical forms describing the class of bases for which each option is open. For each canonical form the conjugation is illustrated by an example. When the bases meeting a certain canonical form can only form their stem IV in one way, the canonical form in question appears only on one line of the table. Otherwise it appears on as many lines as there are different ways of forming stem IV (cf., e.g., lines b1-3 and d1-3). S represents a coronal fricative and H represents a high vocoid. The plus and minus signs simply indicate whether the various rules are observed to operate in each class of bases, and they are not meant to imply the presence of rule features in the lexicon [83].

[82] The only exception is *g(a)* "be, put", stem IV *tt-gga*.

[83] On rule features, cf. Chomsky and Halle (1968). The verbs in table (119) have the following meanings: (a1) "fall", (a2) "take out", (a3) "break open (nuts)", (b1) "plough", (b2) "be tight", (b3) "be colored", (b4) "spend the day", (c1) "buy back", (c2) "flail", (c3) "pour", (c4) "go away", (c5) "visit", (c6) "spare", (c7) "forget", (c8) "pin down", (c9) "cluster", (c10) "hold (a certain capacity)", (c11) "find", (c12) "corner", (c13) "curdle", (c14) "adjoin", (d1) "complete", (d2) "smoke", (d3) "lean against", (d4) "drive", (d5) "emphasize", (d6) "answer", (d7) "crumble", (d8) "be smooth", (d9) "boil", (e1) "lay down", (e2) "spend a pleasant time with persons of the opposite gender", (e3) "dry", (e4) "sign", (e5) "blow".

(119)

		GEM	CHAM	TT	base	I	II	III	IV
a	1	+	+	−	KK	!dr	!d(i)r	!dr	!ttar
	2				Ki	!di	!di	!di	!ttay
	3				KK(a)	rga	rgi	rg	rrag
b	1	+	−	−	KCK	krz	kr(i)z	krz	kkrz
	2				KCi	kri	kri	kri	krri
	3				KC-a	k°la	k°li	klu	kllu
	4				KC(a)	kla	kli	kl	klla
c	1	−	−	+	KC-a	fda	fdi	fdu	tt-fdu
	2				K:K	bbz	bb(i)z	bbz	tt-bbz
	3				K:i	ffi	ffi	ffi	tt-ffi
	4				K:-a	dda	ddi	ddu	tt-ddu
	5				K:(a)	kka	kki	kk	tt-kka
	6				K:a	xxa	xxa	xxa	tt-xxa
	7				K:u	ttu	ttu	ttu	tt-ttu
	8				HCK	udr	ud(i)r	adr	tt-adr
	9				HCi	uli	uli	ali	tt-ali
	10				HC-a	uma	umi	amu	tt-amu
	11				HC(a)	ufa	ufi	af	tt-afa
	12				CVC	ħuz	ħuz	ħuz	tt-ħuz
	13				K:VC	kkil	kkil	kkil	tt-kkil
	14				XaYa	ħada	ħada	ħada	tt-ħada
d	1	−	+	+	KCK	xtm	xt(i)m	xtm	tt-xtam
	2				KCi	kmi	kmi	kmi	tt-kmay
	3				KC-a	sda	sdi	sdu	tt-sdaw
	4				CVC	!sug	!sug	!sug	tt-!swag
	5				uwK:C	uwkkd	uwkk(i)d	uwkkd	tt-uwkkad
	6				CaCC	waʒb	waʒ(i)b	waʒb	tt-waʒab
	7				CCuCi	fruri	fruri	fruri	tt-fruruy
	8				CCuK:C	ħlullf	ħlull(i)f	ħlullf	tt-ħlulluf
	9				K:CCC	!bbrbr	!bbrb(i)r	!bbrbr	tt-!brbar
e	1	−	+	−	SCK	srs	sr(i)s	srs	srus
	2				SC-a	zfa	zfi	zfu	zfaw
	3				SC(a)	zwa	zwi	zu	zaw
	4				SCi	sni	sni	sni	snay
	5				SVC	!sud	!sud	!sud	!swad

Table (119) shows that among the eight (2 times 2 times 2) conceivable combinations for the application of GEM, CHAM and TT, only five are attested. The incompatibility of GEM and TT, which has already been mentioned, is responsible for the inexistence of the combinations [+ − +] and [+ + +] (but cf. note 82). The last missing combination is [− − −]. To account for its absence we assume that in forming its imperfective stem every primary base must undergo one at least of the three rules.

The system looks relatively simple once one sets aside the combinations (119)a and (119)e, which are particular cases. Let us consider combination (119)a right away. It is attested only in four *KK* bases, in two of the *Ki* bases[84], and in four of the bases with a detachable *a*[85]. Elsewhere else GEM and CHAM are incompatible.

Let us refer to those bases which meet the conditions in (112) as geminable bases, and to those meeting the conditions in (116) as infixable bases. Except for combinations (119)a and (119)e (the latter will be considered below), one can picture stem IV formation for primary bases in the following manner. Geminable bases are the only ones whose stem IV cannot be predicted unambiguously. Some of them, which resort to gemination (and for which, consequently, CHAM and TT are excluded), must be marked with the diacritic [+GEM] in the lexicon. All the other geminable bases must have the specification [−GEM] in their lexical entry. The [−GEM] bases and the nongeminable ones are all inputs to rules TT and CHAM. Still setting aside the particular cases (119)a and (119)e, here are the various possibilities, together with the numberings of the lines in (119) where each of them is illustrated.

(120) geminable bases, [+GEM] b1-b4
[−GEM], infixable d1-d3
noninfixable c1

nongeminable bases, infixable ..... d4-d9[86]
noninfixable c2-c14

Primary bases with a mutable *a* which end in *u* in the aorist also end in *u* in the imperfective. Bases with a detachable *a* all end in *a* in the imperfective[87]. When a detachable *a* base is geminable its stem IV is always [+GEM][88]. Thus the stem IV of *!zr(a)* "see" is *!zrra*, that of *!rɣ(a)* "be hot" is *!rqqa*, etc., and the corresponding

[84] Cf. note 75. The only *KK* base no to have a geminated imperfective stem is *nm* "be straight" (*tt-num*). There exists furthermore one *HK* base, *ut* "strike", whose stem III (*ut*) is exceptional with respect to (103), and whose stem IV (*kkat*) has a idiosyncratic initial consonant.

[85] These are *!zda (!zzad)* "grind", *sɣa (ssaɣ)* "buy", *mla (mmal)* "show", *rga (rrag)* "break open (nuts)" and *ɣza (qqaz)* "dig".

[86] On line d4, cf. note 79.

[87] Except for the verbs in (119)a3, on which cf. note 85.

[88] We have found only one exception, *tt-law*, from *lw(a)* (cf. note 90).

[−GEM] forms, which would be *tt-!zar*, *tt-!ray*, etc., are excluded. There are no *KC(a)* bases in (119)c and (119)d. As for the bases which in the aorist resort to the various sporadic processes mentioned in note 62, they form their imperfective stem by prefixing /tt/ to the aorist stem. The imperfective stems of the vergbs given as examples in note 62 are *tt-idras*, *tt-lar*, *tt-ili*, *tt-iri*, *tt-!iwriy*, *tt-issan*, *tt-ini*, *tt-igat*, *tt-!izay*.

Certain geminable bases have two imperfective stems in free variation, while others have only one. Among the geminable bases which only have one stem IV, that stem is [+GEM] for some (type a) and it is [−GEM] for the others (type b). When a geminable base has two stem IV forms in free variation (type c), one is [+GEM] and the other is [−GEM]. The three classes of geminable bases are exemplified below [89].

(121)

	III	IV	III	IV	III	IV
a	krz	kkrz	bri	brri	!ndu	!nttu
b	drk	tt-drak	!mdi	tt-!mday	!rdu	tt-!rdu
c	ftk	fttk ~ tt-ftak	!rmi	!rmmi ~ tt-!rmay	fsu	fssu ~ tt-fsu

The membership of each geminable base in one of the three classes seems to be idiosyncratic.

The fact that a base may yield two imperfective stems corresponding to opposite values of the diacritic [GEM] may be taken to suggest that it is not bases, but rather stems, which carry the specifications [+GEM] and [−GEM] in the lexicon. Even if we assume that this is indeed the case, we can still speak of "[+GEM] bases", for instance, when we wish to refer to those bases with only one [+GEM] stem. A similar remark holds below for the diacritic [D].

Let us now come to case (119)e. We shall account for the peculiar behavior of these bases in stem IV by positing a certain diacritic [+D], which belongs to the underlying representation of certain imperfective stems. The [+D] stems all begin with a coronal fricative [90], but not all the stems beginning with a coronal fricative are [+D] (cf. d3, d4 in (119)). Besides the fact that they do not contain a /tt/ augment, the [+D] imperfective stems differ from those in (119)d by certain details pertaining to the chameleon. Whereas in all other triliteral bases the chameleon is always *a* it is *u* in those triliteral [+D] stems which begin in /sr/ or /ʃr/ and in those which end in a labial: whereas *brz* "wear one's best clothes" yields *tt-braz* and *skr* ([+D] "do") yields *skar*, srs ([+D] "lay down") yields *srus* and *zlf* ([+D] "singe") yields *zluf*. Finally, whereas the chameleon does not as a rule show up in the stem

[89] The verbs in (121) have the following meanings (from left to right in each line): (a) "plough", "wound", "jump", (b) "reach (social position)", "taste", "bless", (c) "sprain", "be tired", "open out (flower)".

[90] Except for *lw(a)* (aorist *lu*) "pluck", which has the [+D] imperfective stem *law*. That base also has a [−GEM] stem IV (*tt-law*).

IV of mutable *a* bases[91] it is regularly inserted in such bases if they are [+D]: *sh-a* "doze" yields *shaw*.

The examples below illustrate the fact that among the bases beginning with a coronal fricative some (a-b) only have a [+D] imperfective stem, others (c) only have a [−D] imperfective stem[92], and yet others (d-e) have in free variation a [+D] stem IV and one or two [−D] ones[93].

(122)

	III	IV [+D]	IV [−D]
a	sni	snay	
b	!sinsg	!sinsig	
c	skkiws		tt-skkiwis
d	!zwi	!zway	!zgg^{o}i
e	zdi	zday	zddi ~ tt-zday

Two points must not be lost sight of in spite of the proliferation of free variants and the arbitrariness (to our present knowledge) of their distribution: the variants are completely predictible once the specifications of the features [GEM] and [D] are known, and the domains where free variation is possible (i.e. the classes of bases for which the values of [GEM] and [D] are idiosyncratic) are defined precisely: they are, on the one hand, the set of all bases meeting the conditions in (112), and on the other hand the set of those bases which begin with a coronal fricative.

Setting aside various irregularities, lines a1 to c12, d1 to d4 and e1 to e5 of table (119) give a complete picture of the conjugation of the various types of primary bases comprised of two or three segments. As for bases with four positions or more, lines c13-14 and d5 to d9 give only a sample of the various types of such bases. But given such a base, and given the value of the feature [D] if it begins with a coronal fricative, the preceding discussion enables one to predict its imperfective stem in all cases.

Various exceptions aside, here is how one can predict the form of the imperfective stem of a given base, let us call it X.

(123) A. Does X begin with a coronal fricative?
1. if no, go to B;
2. if yes, is X marked [+D]?
a. if no, go to B;
b. if yes, apply CHAM and then exit; .....(119)c

[91] There are exceptions, such as (119)d3.

[92] Among the bases beginning with a coronal fricative, all those of the form *KX:K* are [−D], e.g. *skkl (tt-skkal)* "walk stealthily", *!znng (tt-!znnag)* "be congested", *fiyx (tt-fiyax)*, from (/fyyx, !tt-fyyax/) "take as one's master".

[93] The verbs in (122) have the following meanings: (a) "sign", (b) "whistle", (c) "sit", (d) "ladle", (e) "paste".

B. is X biliteral, or is it listed in note 85?
   1. if no, go to C;
   2. if yes, apply CHAM and then go to C; .....(119)a

C. is X geminable, i.e. does it meet (112)?
   1. if no, go to D;
   2. if yes, is X marked [+GEM]?
      a. if no, go to D;
      b. if yes, apply GEM and then exit;.....(119)b

D. apply CHAM and TT and then exit;.....(119)c,d

It should go without saying that in (123) the instructions "apply rule R" must be interpreted in the traditional manner, i.e. the input form is to be modified only if it meets the conditions of the rule. In (123)D, for instance, the verbs of (119)c are subjected as inputs to CHAM (117) as are those of (119)d, and the reason why those of (119)c do not undergo the rule while those of (119)d do, is simply that the latter, but not the former, meet the conditions of the rule. The incompatibility of GEM and TT in the same stem could be accounted for by assuming that GEM is disjunctively ordered before TT: once a given form has been modified by GEM it cannot be submitted as an input to TT. If one sets aside the handful of bases which fall under case (119)a one can also assume that GEM is disjunctively ordered before CHAM, thus accounting for the failure of CHAM to operate in the numerous bases represented by (119)b1,2. Finally, the diacritic [+D] of the bases represented by the examples in (119)e must block at once rules GEM and TT.

8.4. *Remarkable subregularities*

This section deals with a few subregularities which are remarkable exceptions to generalizations made earlier on about the phonological make up of the four verbal stems.

8.4.1. *Radicals beginning with* uw

All verbs beginning with the sequence *uw* are exceptions to rule (103), as illustrated below[94].

(124)	I	III	IV
a	uwzn	uwzn	tt-uwzan
b	uwssr	uwssr	tt-uwssar
c	uwfa	uwfu	tt-uwfu
d	uwʒad	uwʒad	tt-uwʒad

[94] The verbs in (124) have the following meanings: (a) "weigh", (b) "grow old (animal)", (c) "be in excess", (d) "be available".

The initial sequence *uw* in these forms represents a geminate /w/ whose first half is syllabic[95]. Recall that rule (103) only affects segments which are both syllabic and radical initial. In the forms in (124) the first half of the sequence *uw* meets both conditions, but the second half meets neither one. Hayes (1986) and Schein and Steriade (1986) discuss a number of similar cases in which a phonological rule affects a certain segment occurring in an environment E but fails to affect the corresponding geminate if only one half of that geminate meets the contextual requirement E. They argue that this "geminate blockage" is not specific to the particular phonological rules they discuss but follows instead from a general condition on rule application. The condition proposed by Hayes (his Linking Constraint) and that proposed by Schein and Steriade (their Uniform Applicability Condition) are different, but both predict that the application of rule (103) should be blocked in verbs like those in (124). There is no point here in going into the specifics of the proposals made by Hayes and by Schein and Steriade[96], and we refer the reader directly to their work.

The forms in (124)a-IV and (124)b-IV illustrate other peculiarities of the verbs which begin in *uw*: (i) they are subject to chameleon insertion in the imperfective, which is in contradiction with (116)d, and (ii) the chameleon is *a* rather than a copy of the preceding vowel (*u*). We shall not try account for these peculiarities here nor for the other regularities presented in the remainder of section 8.4[97].

8.4.2. *The chameleon in bases with a medial geminate high vocoid*

ITB has a number of primary bases of the form *KH:K* (*H* a high vocoid). In conformity with the generalizations stated in section 8.3. these bases conjugate like the verbs in (119)d. In particular their imperfective stems contain the augment /tt/ and a chameleon vowel. What is puzzling, however, is the fact that the chameleon is always *a* in these verbs, as illustrated below[98].

(125)	I	IV		I	IV
a	qiyd	tt-qiyad	b	fuwt	tt-fuwad
c	ʃiyr	tt-ʃiyar	d	!ʃuwr	tt-!ʃuwar

[95] On geminates in ITB, cf. our previous work.

[96] These proposals also imply that rule (103) should fail to change *i* into *a* at the beginning of verbs beginning with the sequence *iy* (such a sequence would represent an initial geminate /y/). We have not found any verb beginning with *iy*.

[97] In Elmedlaoui (1985: 59 ff.)'s account, ITB has at the most abstract level two sets of high vocoids which behave differently with respect to the syllabification rules, say /w, y/ vs. /W, Y/, and the surface contrast between plain vs. geminate high vocoids in initial position derives from an underlying contrast between the two types of high vocoids, e.g. the underlying representations of *uzn* (cf. (102)b) and *uwzn* (cf. (124)a) are respectively /wzn/ and /Wzn/. It would take us too far afield to discuss that account here.

[98] The verbs in (125) have the following meanings: (a) "record", (b) "spend", (c) "wave at", (d) "act with patience".

The reader may recall that when it is inserted to the left of a vowel the chameleon is a copy of that vowel. This is illustrated in (115)b,c,g, (119)d7,8, and (122)b. In *KH:K* bases the first half of the geminate high vocoid is always syllabified as a vowel (e.g. /qyyd/ is realized as *qiyd*)[99], and consequently one expects the chameleon to be a copy of that (high) vowel, i.e. one expects, e.g., *tt-qiyid* as the imperfective stem in (125)a. But the *KH:K* verbs all have *a* as their chameleon vowel, like the *KK:K* verbs (cf. (118)a,c,e).

ITB does not in general bar the sequences *iyi* and *uwu* from occurring inside words. Instances of *iyi* are found, e.g., in *ħiyi*, which is the negative stem of *ħiy-a* (from /ħyy-a/) "be magnificent", and in *qiyid*, which is the negative stem of (125)a (in free variation with *qiyd*); instances of *uwu* are found in *nuwu* and *quwu*, which are the aorist stems of *nuw-a* "intend" and *quw-a* "be strong" (/nww-a/, /qww-a/)[100]. Notice also that an immediately preceding glide does not in general prevent the chameleon from taking on the quality of a preceding vowel, witness the fact that the chameleon is *i* in *tt-giwir*, *ss-iwid* and *tt-ʃiwir*, which are the imperfective stems of *ggiwr* "sit", *ss-iwd* "frighten" and *ʃiwr* "take advice".

8.4.3. *Final geminates and epenthesis*

The insertion of *i* in negative stems (cf. section 8.2) and that of a chameleon in imperfective stems operate in bases with somewhat similar phonological make ups, but whereas bases ending in a geminate are as a rule subject to chameleon insertion in the imperfective[101] they are systematically immune to negative *i* insertion[102].

(126)

	I	II		IV
a	ssumm	ssumm /	*ssumim	ssumum
b	ssiff	ssiff /	*ssifif	ssifif
c	!ʒʒukrr	!ʒʒukrr /	*!ʒʒukrir	tt-!ʒakrar[103]
d	!gzz	!gzz /	*!gziz	tt-!gzaz
e	bdd	bdd /	*bdid	tt-bdad

9. The morphology of secondary bases

9.1. *Causative bases*

Let us call "radical" what is left of a stem when it is stripped of the augments it may contain. In the forms *asi* (stem III of the base *usi* "carry") and *ss-asi* (stem III

[99] Cf. note 95.

[100] These verbs form their aorist like *ʃqq-a* "be difficult" or *!ħrr-a* "be bitter" (aor. *ʃqqu*, *!ħrru*).

[101] There are exceptions, e.g. *laħħ* (*tt-laħħ*) "disappear", *suqq* (*tt-suqq*) "go to the market-place".

[102] The verbs in (126) have the following meanings: (a) "suck", (b) "winnow", (c) "drag", (d) "crunch", (e) "stand".

[103] Aorist *!ʒʒakrr*.

of the causative base derived from the preceding) the radical is *asi*; in *s-m-yasay* (invariable stem of the causative base derived from the reciprocal base *m-yasay*, which itself is derived from the base *usi*), the radical is *yasay*.

To form a causative base on a given base X one prefixes the augment /ss/ to X. In the stems I, II and III of a causative base /ss-X/ the radicals are identical to those in the corresponding stems of the base X. In each pair of lines in the following table the first line shows the four stems of a primary base, and the second, the corresponding stems of the causative base derived from it [104].

(127)	I	II	III	IV
a	lkm	lk(i)m	lkm	lkkm
a'	ss-lkm	ss-lk(i)m	ss-lkm	ss-lkam
b	kti	kti	kti	ktti
b'	ss-kti	ss-kti	ss-kti	ss-ktay
c	!rda	!rdi	!rdu	tt-!rdu
c'	ss-!rda	ss-!rdi	ss-!rdu	ss-!rdaw
d	lsa	lsi	ls	lssa
d'	ss-lsa	ss-lsi	ss-ls	ss-lsa
e	qql	qq(i)l	qql	tt-qql
e'	ss-qql	ss-qq(i)l	ss-qql	ss-qqal
f	wala	wala	wala	tt-wala
f'	s-wala	s-wala	s-wala	s-wala
g	!udn	!ud(i)n	!adn	tt-!adn
g'	ss-!udn	ss-!ud(i)n	ss-!adn	ss-!adan
h	usi	usi	asi	tt-asi
h'	ss-usi	ss-usi	ss-asi	ss-asay

In sections 8.1. and 8.2. we discussed various regularities relating stems II and III with stem I. Only primary bases were discussed there, but we now see that the same regularities obtain in secondary bases. For instance (127)g and (127)h illustrate the fact that rule (103) operates in all bases, secondary or primary. As illustrated in (127)c (resp. (127)d) a causative base formed on a base with a mutable (resp. detachable) *a* itself has a mutable (resp. detachable) *a*.

Contrary to what (110) would lead one to expect the imperfective stem of causative bases does not begin with a /tt/ augment. In the imperfective, furthermore, the radical of the causative is not always identical with that of the base on which the causative is formed. In particular, GEM never operates in causative bases (cf. a-a', b-b', d-d'). Here also the rule we gave when discussing the primary bases will suffice. Those rules enabled us to derive the stem IV of a primary base from its

[104] The verbs in (127) have the following meanings: (a) "reach", (b) "remember", (c) "bless", (d) "wear", (e) "wait", (f) "follow", (g) "be ill", (h) "carry".

stem III (e.g., to derive *lkkm* from *lkm* in (127)a). The same rules allow us to do the same for secondary bases, e.g. they allow us to derive *ss-lkam* from stem III *ss-lkm* in (127)a'.

All we have to do is include the augment /ss/ in the list of those morphemes beginning in a coronal fricative which are marked [+D]. As explained in section 8.3.4. the presence of this diacritic prevents /tt/ from appearing in the imperfective. Thus causative bases can neither be prefixed with /tt/ nor undergo gemination (which is restricted to primary bases, cf. (112)a), and only rule CHAM may apply to them. The reader may recall that in primary bases, CHAM does not as a rule operate if the radical is of the form Y:Z, (cf. (116)c), if it begins with a vocoid (cf. (116)d), or if it has a mutable *a* (cf. (116)e). These restrictions are waived in causative bases, as illustrated in (127)e', g', h', c', and more generally in all secondary bases [105]. The neutralization of restrictions (116)c, d in secondary bases is understandable if these restrictions are construed as constraining the phonological make up of bases taken as wholes, regardless of their morphological structure: since it begins with the augment /ss/ a causative base cannot be of the form Y:Z (Z a single segment) or begin with a vocoid. Restriction (116)e, on the other hand, implies that when a base is inspected in order to determine whether rule CHAM is applicable, information about the morphological make up of the base must be available.

Another rule which must have access to such information is (103), which can affect a vocoid only if it is the leftmost segment in the radical. We have found a few causative bases which are exceptions to (103). Some are idiosyncrasies of particular verbs [106], while the others appear in a small class of causative bases which are also noticeable in that, contrary to the generalization stated above in the text above (127), their radicals in stems I and II are not identical with those in the corresponding stems of the primary base. In (128) each line contains stems sharing a given root: stems I and IV of the primary base, followed by stems I, III and IV of the causative base derived from it [107].

(128)	I	IV	I	III	IV
a	akkut	tt-akkut	s-ukkt	s-ukkt	s-ukkut
b	asus	tt-asus	ss-uss	ss-uss	ss-usus
c	azzur	tt-azzur	z-uzzr	z-uzzr	z-uzzur
d	akuf	tt-akuf	ss-ukf	ss-ukf	ss-ukuf

[105] The chameleon regularly shows up as *u* in the causative bases which are derived from [+D] bases with an *u* chameleon (on these, cf. section 8.3.4. under (121)). Thus the causative base formed on *slm* (stem IV *slum*) "ingest (a powder)" is *s-slm*, whose stem IV is *s-slum*.

[106] For instance the causative of *iwn* (impf. *tt-awn*) "go up" is *ss-iwn*, whose stem IV is *ss-iwin*, not *ss-awan*.

[107] The primary bases in (128) have the following meanings: (a) "scatter", (b) "fall (hair, fruit)", (c) "winnow", (d) "be uprooted", (e) "drip", (f) "stay up", (g) "fade", (h) "be sieved", (i) "be washed", (j) "be without a lid".

e	addum	tt-addum	s-uddm	s-uddm	s-uddum
f	awwuz	tt-awwuz	zz-iwz	zz-iwz	zz-iwiz
g	!afud	tt-!afud	ss-!ifd	ss-!ifd	ss-!ifid
h	afuf	tt-afuf	ss-iff	ss-iff	ss-ifif
i	arud	tt-arud	ss-ird	ss-ird	ss-irid
j	azuf	tt-azuf	zz-usf	zz-usf[108]	zz-uzuf

In all these cases the radical of the primary base is of the form *aC(:)uK* while the radical of the causative base derived from it is of the form *uC(:)K* or *iC(:)K*[109]. One also finds a few *uC(:)K* causative radicals corresponding to primary bases which are not of the form aK_1uK, e.g. *ss-ugt* (from *ggut* "be abundant"), *zz-ugz* (from *gg°z*, free var. *gg°iz* "go down"), *ss-ufɣ* (from *ffɣ*, free var. *ffuɣ* or *ffaɣ* "go out"). Together with certain reciprocal and passive bases to be discussed in the next sections, causative bases which behave like those in the table above clearly show the existence, in the (synchronic) verbal morphology of ITB, of root and template morphology of the sort found in Arabic or in Hebrew.

The augment /ss/ is subject to two types of alternations. There are on the one hand those which involve quantity (it shows up as a geminate in some environments but not in others), and on the other hand those which involve voicing and the feature [anterior]. The former are rather complex and will not be discussed here. As for the latter, the regularities are straightforward: setting aside the effects of a late rule of voicing assimilation, the augment is realized as voiced if and only if a voiced coronal fricative occurs somewhere else in the stem, and it is realized as nonanterior if and only if a nonanterior coronal fricative occurs somewhere else in the stem[110].

(129)

a. ʃ-ħaʃa	b. ʃʃ-!rʃq	c. ʃ(ʃ)-ʕiʃ
d. zz-gzul	e. zz-g°raz	f. zz-ugz
g. ʒʒ-nʒm	h. ʒ-!gruʒʒm	i. ʒ-guʒʒi
j. z-m-zaray	k. ʃ-m-ħaʃa	l. ʒ-m-ʒaħad

The causative bases in (129)j,k,l are formed on reciprocal bases[111].

[108] On the voicelessness of the penultimate consonant, cf. note 111.

[109] There also exist bases of the form aK_1uK which form their causative according to the general case, e.g. *!azum (zz-!azum)* "fast", *aywul (ss-aywul)* "be tall", *agur (ss-agur)* "remain", *aggug (ss-aggug)* "be far", *attuy ((s)s-attuy)* "be high", *akmur (ss-akmur)* "be near", *akrur (ss-akrur)* "trail".

[110] The verbs in (129) have the following meanings: (a) "cause to be fed up", (b) "cause to be happy", (c) "cause to live", (d) "shorten", (e) "cause to regret", (f) "take down", (g) "keep unharmed", (h) "cook inadequately", (i) "cause (insects) to congregate", (j) "cross", (k) "cause to be fed up with one another", (l) "cause to quarrel".

[111] Even when the radical contains a voiced coronal fricative, the causative augment is always realized as voiceless in case the initial segment in the radical is a voiceless obstruent, as for instance in the causative bases *s-kuwz* "cause to prostrate in an obscene manner", *s-k°rkz* "scratch off (like a chicken)", *ʃ-!quʒʒi* "tear off", *ʃ-!ħruʒʒd* "roughen", *ʃ-ħʒbubbr* "curl up". There are other occurrences of assimilatory devoicing in ITB, as for instance in /t-awwuz-t/ 2s-stay:up:pf-2s "you stayed up", which can be realized either as *tawwuzt* or as *tawwust*. Assimilatory devoicing in ITB has yet to be studied in detail.

9.2. *Reciprocal bases*

All reciprocal bases begin with the augment /mm/[112]. In some the radical is identical to that of the input base, cf., e.g., *mm-zdi*, from *zdi* "join"; in others the radical is the result of mapping the base onto a template of the form *WaYaZ* (*Z* a single segment), cf., e.g., *m-zaray*, from *zri* "go past". The reciprocal bases of the latter type will be termed templatic, and those of the former type, nontemplatic.

Some verbs only have a nontemplatic reciprocal form, cf., e.g., *ksa (mm-ksa / *m-kasa)* "pasture", others only have a templatic one, cf., e.g., *!srd (m-!sarad / *mm-!srd)* "sue", and others yet have both reciprocal forms in free variation, cf., e.g. *ʒaħd (m-ʒaħd / m-ʒaħad)* "quarrel", *ħʃʃm (n-ħʃʃm / n-ħaʃʃam)* "be shy". The distribution of the verbs between these three classes has yet to be studied in detail[113]. In what follows, by giving only one of the two conceivable reciprocal forms of a given base, we do not mean to imply anything about the grammaticality of the other.

The nontemplatic reciprocal bases conjugate in the same manner as the causative bases, except that the augment /tt/ regularly occurs in the imperfective. Here are examples that the reader may compare with those in (127)[114].

(130)	I	II	III	IV
a	krf	kr(i)f	krf	kkrf
a'	(m)m-krf	(m)m-krf mm-krif	(m)m-krf	tt-mmkraf
b	kti	kti	kti	ktti
b'	mm-kti	mm-kti	mm-kti	tt-mm-ktay
c	ʒla	ʒli	ʒlu	ʒllu
c'	mm-ʒla	mm-ʒli	mm-ʒlu	tt-mm-ʒlaw
d	ksa	ksi	ks	kssa
d'	mm-ksa	mm-ksi	mm-ks	tt-mm-ksa
e	ttu	ttu	ttu	tt-ttu
e'	mm-ttu	mm-ttu	mm-ttu	tt-mm-tt(a)w
f	ħada	ħada	ħada	tt-ħada
f'	m-ħada	m-ħada	m-ħada	tt-m-ħada

Everything that was said in section 9.1. about the conjugation of the causative bases carries over to the nontemplatic reciprocal bases, except for the following point.

[112] The reciprocal augment is realized as a coronal nasal when prefixed to certain bases containing a labial consonant. It is also subject to quantity alternations similar to those which are found in the causative augment.

[113] It is predictable to some extent; for instance, bases with an initial syllabic vocoid do not accept nontemplatic reciprocal forms, which explains why in (130) there are no analogues of the forms in (127)g,h.

[114] The primary bases in (130) have the following meanings: (a) "tie up", (b) "remember, (c) "lose", (d) "pasture", (e) "forget", (f) "adjoin".

The reader may recall that for a base to be [+D] it must begin with a coronal fricative, and that all causative bases fulfill that condition on account of the causative augment /ss/. The reciprocal bases, on the other hand, do not meet that condition since their initial segment is a nasal; they must be [−D], and hence regularly undergo rule TT (110). The preceding considerations imply that the specification of [D] for a given base depends on the initial segment of that base, and cannot be inherited from some other base embedded in it. That this is indeed the case is shown by the fact that all reciprocal bases undergo rule TT, even those derived from bases which are [+D]. For instance *zri* "go past" and *syl* "measure (length)" are [+D], witness the augmentless imperfectives *zray* and *syal*, but the reciprocal forms are [−D]: *mm-zri* and *mm-syl* give *tt-mm-zray* and *tt-mm-syal* in the imperfective.

Here are examples of templatic reciprocal stems [115].

(131)	I	II	III	IV
a	fra	fri	fru	frru/tt-fru
a'	n-fara	n-fara	n-fara	tt-n-fara
b	γza	γzi	γz	qqaz
b'	m-γaza	m-γaza	m-γaza	tt-m-γaza
c	smuqql	smuqq(i)l	smuqql	smuqqul
c'	mm-smaqqal	mm-smaqqal	mm-smaqqal	tt-mm-smaqqal
d	ss-iwn	ss-iwn	ss-iwn	ss-iwin
d'	m-sawan	m-sawan	m-sawan	tt-m-sawan

Except for the appearance of the augment *tt* in the imperfective, templatic forms are invariable across the four stem classes. This invariability is not specific to these forms, but follows from general features of the conjugation of all bases, primary or secondary. Among the rules discussed in section 8, TT is the only one whose conditions are met by the templatic forms ending in a nonsyllabic segment (cf. (131)c,d), as the reader may easily ascertain. And the same is true for the templatic forms which end in a vowel (cf. (131)a,b). Their final *a* can only be an invariable *a*, as is the case for all bases of the form C_1aC_1a (cf. section 8.1.1.).

Templatic reciprocal forms can be derived from causatives, witness (131)d. Causatives can be derived from both types of reciprocal stems. For instance *!ʒggr* "hamper" has a nontemplatic reciprocal form (*m-!ʒggr*) as well as a templatic one (*m-!ʒaggar*), and each in turn yields a corresponding causative stem: *ʒ-m-!ʒggr*, *ʒ-m-!ʒaggar*.

We shall not discuss here the formal relationship between the templatic reciprocal radicals and the corresponding primary bases. In view of the interest of this

[115] The primary bases in (131) have the following meanings: (a) "disentangle", (b) "dig", (c) "look", (d) "take up".

question for the theory of nonconcatenative morphology it will be examined in a separate article (Dell and Elmedlaoui (in preparation)).

9.3. *Passive bases*

All passive bases begin with the augment /tt/ (homophonous with the imperfective augment). Like reciprocal bases, passive bases are of two types. Those of the first type are comprised of the augment /tt/ and of a radical which is identical to that of the input base, cf. (132)a',b',c'. Those of the second type are of the form *tt-ya(w)YaZ* (*Z* one segment at most), cf. (132)a'',b'',c'', and will be referred to as templatic passive bases, on account of their similarity with the templatic reciprocal bases. Lines (132)a,b,c represent the four stems of primary bases meaning respectively "do", "forget" and "eat (of animals)", and the following lines represent the corresponding passive stems. The imperfective augment never occurs in the passive.

(132)	I	II	III	IV
a	skr	sk(i)r	skr	skar
a'	tt-skr	tt-sk(i)r	tt-skr	tt-skar
a''	tt-yawskar	tt-yawskar	tt-yawskar	tt-yawskar
b	ttu	ttu	ttu	tt-ttu
b'	tt-ttu	tt-ttu	tt-ttu	tt-ttu
b''	tt-yawttaw	tt-yawttaw	tt-yawttaw	tt-yawttaw
c	frrd	frr(i)d	frrd	tt-frrad
c'	tt-frrd	tt-frr(i)d	tt-frrd	tt-frrad
c''	tt-yawfrrad	tt-yawfrrad	tt-yawfrrad	tt-yawfrrad

Bases of the form *uKX* (*X* any nonnull string) give rise to templatic passive bases of the form *tt-yaYaZ*, cf. (133)j,k. All others give rise to templatic passive bases of the form *tt-yawYaZ*. Whereas the templatic reciprocal bases all contain two occurrences of *a*, the templatic passive bases contain two or three such occurrences, depending on the number of vowels present in the input base. If two nonsyllabic segments are separated by a vowel in the input base, they must be separated by an *a* in the corresponding templatic passive base. Here are a few examples with the input base in column A, the templatic reciprocal in column B and the templatic passive in column C[116].

(133)	A	B	C
a	zgr	m-zagar	tt-yawzgar
b	ħʃʃm	n-ħaʃʃam	tt-yawħʃʃam
c	xalf	n-xalaf	tt-yawxalaf / * tt-yawxlaf

[116] The verbs in (133) have the following meanings: (a) "go across", (b) "be shy", (c) "place crosswise", (d) "take out", (e) "call", (f) "discontent", (g) "displace", (h) "fear", (i) "look for", (j) "take", (k) "seize", (l) "shut".

d	ss-ufγ	m-safaγ	tt-yawsafaγ / * tt-yawsfaγ
e	!γr(a)	m-!γara	tt-!yawγra
f	ħaʃa	m-ħaʃa	tt-yawħaʃa / * tt-yawħʃa
g	s-itti	m-sattay	tt-yawsattay / * tt-yawsttay
h	!ksud	m-!kasad	tt-!yawksad
i	siggl	m-saggal	tt-yawsaggal / * tt-yawsggal
j	usi	m-yasay	tt-yasay
k	!umz	n-!yamaz	tt-!yamaz
l	qqn	m-yaqqan	tt-yawqqan

REFERENCES

ABDEL-MASSIH, E. T. (1968), *Tamazight Verb Structure. A Generative Approach*, Bloomington: Indiana University Publications.

APPLEGATE, J. R. (1958), *An Outline of the Structure of Shilha*, New York: American Council of Learned Societies.

BASSET, A. (1929), *La langue berbère, morphologie, le verbe, étude de thèmes*, Paris: Leroux.

BASSET, A. (1932), Note sur l'état d'annexion en berbère, *Bulletin de la Société de Linguistique de Paris* 33, 173-174.

BASSET, A. (1945), Sur la voyelle initiale en berbère, *Revue Africaine* 402-403, 82-88.

BASSET, A. (1949), Sur le participe berbère, *Comptes Rendus du Groupe Linguistique d'Études Chamito-Sémitiques* V, 34-36.

BASSET, A. and A. Picard (1948), *Éléments de grammaire berbère (kabylie-Irjen)*, Algiers: «La Typo-Litho» and Jules Carbonel.

BENTOLILA, F. (1969), Les modalités d'orientation du procès en berbère, *La Linguistique* 1, 85-96; 2, 91-111.

BENTOLILA, F. (1979), Les valeurs modales en berbère (parler des Aït Seghrouchen d'Oum Jeniba, Maroc central), in M. Mahmoudian, ed., *Linguistique Fonctionnelle*, Paris: PUF, 191-202.

BENTOLILA, F. (1981), *Grammaire fonctionnelle d'un parler berbère; Aït Seghrouchen d'Oum Jeniba (Maroc)*, Paris: SELAF.

CHAKER, S. (1983), *Un parler berbère d'Algérie (Kabylie): syntaxe*, Aix-Marseille: Publications Université de Provence, J. Lafitte.

CHAKER, S. (1984), Système des oppositions verbales (kabyle), formes et valeurs, in S. Chaker, *Textes en linguistique berbère*, 160-176, Paris: Éditions du CNRS.

CHOMSKY, N. (1965), *Aspects of the Theory of Syntax*, Cambridge, Mass., MIT Press.

CHOMSKY, N. and M. HALLE (1968), *The Sound Pattern of English*, New York: Harper and Row.

CLEMENTS, G. N. (1985), Compensatory Lengthening and Consonant Gemination in LuGanda, in Sezer and Wetzels, eds.

COMRIE, B. (1981), *Language Universals and Linguistic Typology*, Chicago: University of Chicago Press.

DELL, F. and M. ELMEDLAOUI (1985), Syllabic Consonants and Syllabification in Imdlawn Tashlhiyt Berber, *Journal of African Languages and Linguistics* 7, 105-130.

DELL, F. and M. ELMEDLAOUI (1988), Syllabic Consonants in Berber: some new evidence, *Journal of African Languages and Linguistics* 10, 1-17.

DELL, F. and M. ELMEDLAOUI (in preparation), Nonconcatenative morphology in Imdlawn Tashlhiyt Berber.

ELMEDLAOUI, M. (1985), *Le parler berbère chleuh d'Imdlawn: segments et syllabation*, Doctorat de troisième cycle, Université de Paris VIII.

ENNAJI, M. and F. SADIQI (1986), The Syntax of Cleft Sentences in Berber, *Studies in Language* 10, 53-77.

GALAND, L. (1964), L'énoncé verbal en berbère, *Cahiers Ferdinand de Saussure* 21, 33-53.

GALAND, L. (1969), Types d'expansion nominale en berbère, *Cahiers Ferdinand de Saussure* 25, 83-100.

GALAND, L. (1973), Lybique et berbère, *Annuaire de l'École Pratique des Hautes Études, IV^e section*, 173-179.

GALAND, L. (1974), Défini, indéfini, non-défini: les supports de détermination en touareg, *Bulletin de la Société de Linguistique de Paris* 69-1, 205-224.

GALAND, L. (1977), Continuité et renouvellement d'un système verbal: le cas du berbère, *Bulletin de la Société de Linguistique de Paris* 72-1, 275-303.

GALAND, L. (1979), Relations du verbe et du nom dans l'énoncé berbère, in C. Paris, éd., *Relations prédicat actant(s) dans des langues de types divers*, I, 131-143, Paris: SELAF.

GUERSSEL, M. (1983)a, A Phonological Analysis of the Construct State in Berber, *Linguistic Analysis* 11-3, 309-330.

GUERSSEL, M. (1983)b, *An Outline of the Structure of Berber*, unpublished, MIT.

GUERSSEL, M. (1985), The role of sonority in Berber syllabification, *AWAL* 1, 81-110.

GUERSSEL, M. (1986), Glides in Berber and Syllabicity, *Linguistic Inquiry* 17, 1-12.

HAYES, B. (1986), Inalterability in CV Phonology, *Language* 62, 321-351.

LEGUIL, A. (1981), Le schéma d'incidence en berbère, *Bulletin des Études Africaines* I-1, 35-42.

LEGUIL, A. (1982), La naissance des temps en chleuh, *Bulletin des Études Africaines* II-3, 57-84.

PENCHOEN, T. G. (1973), *Tamazight of the Ayt Ndhir*, Los Angeles: Undena Publications.

SCHEIN, B. and D. STERIADE (1986), On Geminates, *Linguistic Inquiry* 17, 691-744.

SEZER, E. and L. WETZELS, eds. (1985), *Studies in Compensatory Lengthening*, Dordrecht: Foris.