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Syllabic Consonants and Syllabification in Imdlawn Tashlhiyt Berber

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1. PRELIMINARIES

This article deals with the Tashlhiyt dialect of Berber as spoken in the Imdlawn valley, seventy kilometers northeast of the city of Taroudant, in the Western Higher Atlas. One of us (ME) is a native speaker of that dialect, which will henceforth be referred to as ITB. A more detailed treatment of some of the points discussed here will be found in Elmedlaoui (1985).

ITB has syllabic consonants (sonorants and obstruents), and the eligibility of a segment for being a syllabic peak depends on its position in the sonority hierarchy (sections 2 and 3). Before a pause two syllables may be fused into one (section 4). Long segments behave as asymmetrical sequences of two units (section 5).

The regularities discussed in this article are independent of grammatical categories or of the morphological make up of words. They are exceptionless, as far as we know.

ITB has three vowels *a, i* and *u*,[1] and the semivowels *y* and *w*. We shall call the segments *i, y, u*, and *w* high vocoids (henceforth HV). *i* and *y* are in complementary distribution in the phonetic representations, and so are *u* and *w*: if a HV is adjacent to a syllabic segment it must be a semivowel, otherwise it must be a vowel. For instance the 3m. sg. prefix shows up as *y* when the following segment is syllabic, and as *i* otherwise (cf. (1)), and the 2 pl. pronoun is pronounced *un* when the preposition which governs it ends in a nonsyllabic segment, and *wn* if that preposition ends in a syllabic segment (cf. (2)):

(1) a. *y-attuy* 'it is high' b. *i-skR* 'he does'

(2) a. *imi-nn-un* 'your mouths' b. *i-kRz-a-wn* 'he ploughed for you'[2]

Consonantal sonorants can appear as syllabic peaks in ITB, and so can fricatives and stops. (3) presents syllabicity alternations in the initial consonant of verbs (3 m. sg. vs. 3 f. sg.) All verbs are in the perfective

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aspect. Syllabic consonants are indicated by a capital or by an apostrophe (cf. fn. 1). On the phonetic properties of syllabic consonants, cf. section 3.

(3)	*ildi*	*tLdi*	'pull'
	irba	*tRba*	'carry on one's back'
	inda	*tNda*	'shake (milk)'
	imda	*tMda*	'be worn out'
	izdi	*tZdi*	'put together'
	iǯla	*tǯ la*	'get lost'
	iγza	*tγ 'za*	'dig'
	iħda	*tħ 'da*	'give (gift)'
	isti	*tSti*	'select'
	ifsi	*tFsi*	'untie'
	ixsi	*tXsi*	'go out (fire)'
	iħba	*tħ 'ba*	'cover'

(4) presents syllabicity alternations in the last consonant of verbs. On each line the form on the left is the 2 sg. perfective (the 2 sg. marker is /*t*–. . . –*t*/) and that on the right is 3 f. sg. perfective (3 f. sg. is /*t*–/) with a dat. 3 m. sg. object (/–*a*–*s*/).

(4)	*tRgLt*	*tRglas*	'lock'
	tSkRt	*tSkras*	'do'
	tXzNt	*txZnas*	'store'
	tZdMt	*tZdmas*	'gather wood'
	! tLbZt	*! tLbzas*	'step onto'
	tLbǯt	*tLbǯas*	'idem'
	tRkSt	*tRksas*	'hide'
	tNšFt	*tNšfas*	'graze (skin)'
	tMsXt	*tMsxas*	'transform'

Aside from a well-defined class of problematic cases which all involve HV's (cf. the end of section 2), there is no reason to posit an underlying syllabicity contrast in ITB, as we shall see. *i* and *y* can be derived as two variants of the same underlying segment, and so can *u* and *w*, *l* and *L*, *r* and *R* and so on.

Following recent proposals,[3] we take the syllabicity of a segment to be a function of that segment's position in syllable structure, and not a specification of some distinctive feature such as [syllabic]. Every syllable is represented by a tree which has one and only one "head" (the syllabic peak), and to say that a given segment is syllabic is the same thing as to say that that segment is associated with the head node of a syllabic tree. Let *I* stand for the specifications [+son, –cons, +high, –back, –round],

and *U* for [+son, –cons, +high, +back, +round]. The phonetic transcriptions [*suy*], [*zwi*] and [*tMzimt*] are simply shorthand notations for the following representations, where the syllabic peak is indicated by a star.

(5)

For convenience we will sometimes make use of *(sU 'I), (zUI ')* and *(tm ') (zi 'mt)* as just another way of representing the objects in (5), with the parentheses standing for an associated S node and with the apostrophe to indicate that the preceding element is a head. When we wish to make the syllabification more conspicuous in a phonetic transcription, syllables will be seperated by dots: *tM . zimt*. Following current practice, within a syllable, the sequence of segments preceding the peak will be called the onset, and the sequence of segments following it, the coda. The sequence of segments comprised of the peak and the coda (if there is one) is called the rime. In *zimt* the onset, coda and rime are respectively *z, mt, imt*, and in *tM* where there is no coda, the onset and rime are respectively *t* and *M*.

The representations in (5) are comprised of two layers, a sequence of syllabic trees, which we will call the syllabic layer, and a distinctive feature matrix, which we will call the segmental layer. In all recent works which develop some form or other of the framework sketched above, a central question is that of characterizing the dependencies between the syllabic layer and the segmental layer. These are highly constrained, witness the remarkable fact that in most languages (ITB is no exception) the contents of the syllabic layer comes close to being completely predictable from that of the segmental layer and from morphological and syntactic structure.[4] This fact is what motivates various attemps to design syllabification procedures, that is, devices which mechanically assign a syllabic structure to a sequence of segments.[5]

In what follows we endeavour to develop such a procedure for ITB and point out some problems that the facts of ITB present for various general approaches to syllabification that have been proposed recently.

It has been proposed in various recent studies on syllabification that the grammar of each language define a set of templates which characterize the syllable types possible in that language.[6] According to these proposals, in order to syllabify a string of segments, one analyzes it as a sequence of substrings each of which must match one of the syllable templates.[7] For instance, in Tamang, a Tibeto-Burman language spoken in Nepal, the only possible syllable types are (C)V(C) and CRV(C), where R is a non-nasal

sonorant (cf. Mazaudon 1973). The string */pinpa/* must be analyzed as *(pin) (pa)*, i.e. as CVC . CV. The syllabification *(pi) (npa)* is ill-formed because *npa* can be analyzed neither as CV nor as CRV. How would such an approach work for ITB?

(6) *tagrurt* */t–agrUr–t/* 'stable'

(7) *sawLx* */saUl–x/* 'I spoke'

(6) shows that ITB allows syllables of the form CV ' C *(tag)* and CV ' CC *(rurt)*, and (7) that it allows syllables of the form CV ' *(sa)* and CC ' C with a HV in onset position and a sonorant consonant as a peak *(wLx)*. The forms in (3) furthermore show that ITB allows syllables of the form CC ' . Let us assume for a moment that our grammar of ITB contains a device that characterizes these syllable types as well formed. Consider now the following.

(8) *ratlult* */ra–t–lUl–t/* 'you will be born'

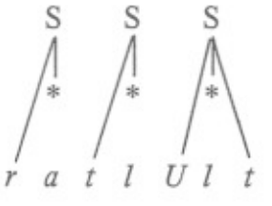
The syllabification in agreement with the phonetic representation in (8) is *(ra ' t) (lU ' lt)*, indeed a licit one since, as we have just seen, CV ' C and CV ' CC are possible syllable types in ITB. But the set of possible syllable types of ITB also allows the syllabification CV ' . CC ' . CC ' C, i.e. *(ra ') (tl ') (Ul ' t)*, which is equivalent to [*ratLwLt*]. There is no general prohibition against words with the syllabic structure CV' . CC' . CC' C, witness [*ratRgLt*], i.e. *(ra ') (tr ') (gl ' t)*;[8] rather, the string */ratlUlt/* simply does not belong to the set of those which can take such a syllabic structure.

The situation, then, is this. The grammar of ITB must characterize the object (9) as ill formed, although neither the syllabic structure (9)a nor the segmental sequence (9)b is in itself ill formed. The source of the mismatch between (9)a and (9)b cannot be located in any one of the three syllables taken individually.

(9)

a.

b.



A definition of the set of possible syllable types is not enough to enable one to syllabify any string of segments in ITB. Such a definition should be supplemented with statements constraining the sequencing of well-formed

syllables in words and utterances. When there is more than one way in which some string of segments can be analyzed as a sequence of substrings each of which is a possible syllable in the language, these statements could be used as disambiguating devices. Problems of this sort are common in the litterature on syllabification. They most often have to do with the location of syllable boundaries in intervocalic clusters: should *extra* be syllabified *ek . stra* or *eks . tra*?. In cases like these the location of syllable peaks is the same in the two competing syllabifications. In ITB, on the other hand, even the location of the syllabic peaks cannot be taken for granted, due to the fact that any segment is able to occur as a syllabic peak. Before we go any further let us introduce the prohibition of hiatus and the sonority scale. By the prohibition of hiatus we mean the following empirical generalization.

(10) Abutting syllabic peaks are never allowed to occur in the phonetic representations of ITB.

Here "abutting" means "not separated by a silence", and (10) holds without exception and regardless of morphological and syntactic structure.[9] The sonority scale is an ordered sequence of segment types specified by Universal Grammar. For our purposes in this article, the following will be enough.

(11) voiceless stop, voiced stop, voiceless fricative, voiced fricative, nasal, liquid, HV, *a*

The more to the right of the scale a class of segments, the more sonorous its members are said to be, or equivalently, the higher their degree of sonority. *I* is more sonorous than *n*, which is more sonorous than *s*.[10]

Because of (10) a string containing two adjacent segments P and Q can never be syllabified with both P and Q syllabic. The choice of (8) over (9) is a particular case of the following empirical generalization.

(12) When a string . . . PQ . . . could conceivably be syllabified either as . . . P ' Q . . . or as . . . PQ ' . . . (i.e. when either syllabification would involve only syllable types which, taken individually, are possible in ITB), the only syllabification allowed by ITB is the one that takes as a syllabic peak the more sonorous of the two segments.

In */ra–t–lUl–t/*, */U/* is more sonorous than the preceding */l/*, and thus (8) is selected against (9).

The prohibition of hiatus (10) overrides (12), as exemplified by the

fact that */t–lUa–t/* (a place name) can only be pronounced [*tLwat*], i.e. *(tl ') (Ua ' t),* whereas (12) leads one to expect [*tluat*], i.e. *(tlU ') (a ' t),* which is in contradiction with (10).[11]

The overriding effect of (10) over (12) can also be seen in the distribution of the GR syllables. Call GR syllables (G a mnemonic for "glide" and R for "resonant") those syllables which, like *wLx* in (7), have a HV as their onset and a consonantal sonorant as their peak. In ITB words, GR syllables only occur immediately after a syllabic peak,[12] i.e. they occur only in contexts where a hiatus would ensue if, in conformity with (12), the HV were taken as a peak rather than the following sonorant.[13] Here are other forms containing GR syllables.[14]

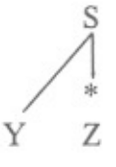
(13)	*ti . wN . tas*	*/t–IUn–t–a–s/*	'you climbed on him'
	ra . yMm . γi	*/ra–I–mmγI/*	'he will grow'
	! ra . yRz	*/ra–I–! rz/*	'it will be broken'
	ħa . wL . tN	*/ħaUl–tn/*	'make them (m.) plentiful'

2. CORE SYLLABLES

Rather than have in our grammar two separate sets of statements, one to define the class of well-formed syllable types, and the other to constrain the sequencing of the syllable types in words and utterances, we will adopt what Steriade (1984) has dubbed a rule based approach to syllabification. As a testimony of our debt to Clements and Keyser (1983) and to Steriade (1982, 1984), we will borrow from them the expression "core syllabification", but it should be clear that we use it in a different sense from them.

Let us assume that the lexical representations of ITB do not contain any syllabic trees but only strings of segments, and that syllabic trees are constructed over strings through the operation of phonological rules. The grammar of ITB contains in particular a set of rules which build core syllables. Core syllables are trees of the form (14)a of (14)b, where Y and Z each stand for a column of feature specifications.

(14) a.



b.

We propose that the core syllable building rules are instantiations of the following rule schema.

(15) CS (Core syllabification): associate a core syllable with any sequence (Y)Z, where Y can be any segment and Z is a segment of type T, where T is a variable to be replaced by a certain set of feature specifications.

For instance, replacing T by the expression [–cons, +son, +low] in (15) yields a rule which builds a core syllable over any sequence (Y)*a*, where Y is any segment. We assume that the variable T in (15) takes on successively all the values given in the sonority scale in (11). We assume furthermore that the various rules of core syllable construction derived in that manner from (15) apply in the order specified by the sonority scale, starting from the *a* end of the scale. (15) will then yield in particular the following rules, which will apply in the order given:

(16) CS(*a*) associate a core syllable with any sequence (Y)Z, where Z is an *a*

(17) CS(HV) associate a core syllable with any sequence (Y)Z, where Z is a HV

(18) CS(L) associate a core syllable with any sequence (Y)Z, where Z is a liquid

(19) CS(N) associate a core syllable with any sequence (Y)Z, where Z is a nasal consonant

And so on.

The output of the syllabification rules must not violate various well-formedness conditions on syllable structure, among which are the following.

(20) every segment must be associated to an S node

(21) a segment can be associated to at most one S node

One way to enforce (21), i.e. to prohibit overlapping syllables, is to assume the following.

(22) CS can build core syllables only over (Y)Z sequences where neither Y nor Z have yet been syllabified.

Consider for instance the sequence */t–!IzrUal–In/* 'those (f.) from Tazrwalt', which is pronounced [*!tizRwalin*]. The construction of syllabic structure proceeds as follows:

(23) (i) CS(a) (ii) CS(HV) (iii) CS(L)

During step (i) the string is scanned for sequences (Y)*a; Ua* is such a sequence, and *U* must be syllabified with *a*, in compliance with the standard conventions for the interpretation of parentheses in phonological rules. In step (ii), the string is scanned for sequences (Y)Z where Z is a HV. *rU* is such a sequence but according to (22) *U* is not available anymore for syllabification because it has already been associated with an S node in step (i); similarly in step (iii) *l* is not available anymore as a peak since it has been associated with an S node through the HV pass of CS.

Given a sequence like */tlUrtnt/*,[15] the HV pass of CS will first yield *t(lU ')rtnt*, the pass for the nasals will yield *t(lU ')r(tn ')t*, and we are now left with a string where CS cannot anymore apply.[16] We assume that at that point various attachment rules apply, whose role is to syllabify the segments not yet syllabified by CS. These rules make codas and complex onsets from the leftovers of CS, as it were. They are responsible for the final syllabification *(tlU ' r)(tn ' t)*, where every segment is associated to an S node, as required by (20).

Since the rules in (16)-(19) are ordered in such a way that more sonorous segments are eligible as syllabic peaks earlier than less sonorous ones, in a sequence YZ syllabified by CS the level of sonority of Y is in most cases[17] lower than or equal to that of Z.

The organization ascribed here to the syllabification mechanisms makes the prediction that no rime in ITB should contain a sequence of segments where the first has a lesser degree of sonority than the second; for instance there should not exist a syllable like *kmr* with *m* as its syllabic peak, for such a sequence would have been syllabified as *k(mr)* by the pass for the liquids, which precedes the pass during which the nasal *m* becomes available for grouping with the preceding *k*. This prediction is in accord with the data. The apparent counterexamples to it are all found in syllables with complex codas, which arise through the operation of annexation rules such as the one discussed in section 4. Here are forms illustrating the operation of CS.

(24)	a.	*iγ . mL*	*/I–γml/*	'it (m.) went mouldy'
	b.	*i . sLm*	*/I–slm/*	'it (f.) went numb'
	c.	*tzMt*	*/t–zmt/*	'it (f.) is stifling'
	d.	*tMzħ*	*/t–mzħ/*	'she jested'

e.	*txZ . nakk*^{w}	/*t–xzn=akk*^{w}/	'she even stockpiled'
f.	*tbX . lakk*^{w}	/*t–bxl=akk*^{w}/	'she even behaved as a miser'
g.	*u . tXk*	/*Ut–x–k*/	'I struck you'
h.	*ma . ra . tGt*	/*ma=ra–t–g–t*/	'what will happen of you?'[18]
i.	*ra . tK . ti*	/*ra–t–ktI*/	'she will remember'
j.	*tF . tKt*	/*t–ftk–t*/	'you suffered a sprain'

One can partition the segment inventory of a language into three classes: 1 those segments which only occur as syllabic peaks, 2 those which never occur as peaks, and 3 those which sometimes occur as peaks and sometimes do not. In French, for instance, class 1 consists of all the [–cons, –high] segments, class 2 consists of all the [+cons] segments, and class 3 consists of all the [–cons, +high] segments. In most languages class 3 is very small or altogether empty, and consequently most syllabic peaks in most strings belong to class 1. Various syllabification algorithms have been proposed recently[19] which crucially rely on that fact. They operate as follows: first, scan the string for all segments of class 1 and mark each of these as a syllabic peak, and then syllabify the remaining segments as onsets or codas. These algorithms differ from one another in various respects but they all share the assumption that in a string of segments most syllable peaks can be located by a procedure which examines one segment at a time and checks its feature content to determine whether it belongs to class 1. ITB poses a problem for all such algorithms, for in that language all the segments belong to class 3, and consequently one cannot in general determine whether a given segment in a string is a syllabic peak simply by examining its feature specifications independently of those of the surrounding segments.

ITB allows onsetless syllables, but these can occur only immediately after a pause. Postpausally, *ikru* 'kid' may be pronounced with smooth voice ingress, i.e. with what is usually taken to be the phonetic reflex of the absence of an onset, or of a void onset. Not only vocoids can be syllabic immediately after a pause, but also consonants, cf. e.g. /*rgl*/ 'lock', which is pronounced [*RgL*] after a pause.[20] In (10) the prohibition of hiatus was presented as a constraint on pairs of adjacent syllables. It is more approriate to incorporate it into our grammar as a constraint on individual syllables:

(25) All syllables in ITB must have an onset.

This constraint does not apply to postpausal syllables.[21] To see how (25) interacts with CS, consider /*l–ħaUl–tn*/ 'he made them (m.) plentiful', which is pronounced *i .ħa . wL . tN* in isolation. CS(a) yields *I(ħa ')Ultn* (we leave out the morpheme boundaries, which are irrelevant here).

CS(HV) then scans the string for sequences (Y)Z with Z a HV. *I* and *U* are such sequences, with Y empty. The application of CS(HV) should thus yield *(I ')(ħa ')(U ')ltn*, a string which would result in a phonetic representation where, short of making a pause after *a*, the onsetless syllable *(U ')* would violate (25). Whenever an application of CS at a particular point of the string would result in a violation of (25), we assume that that application is omitted. In the present case CS(HV) will only apply to *I*, hence *(I ')(ħa ')Ultn*. CS(L) will then apply, yielding *(I ')(ħa ')(Ul ')tn*, and finally CS(N), hence *(I ')(ħa ')(Ul ')(tn ')*.

A sequence such as */kIUt/* contains two adjacent segments which are eligible for syllabicity during the same pass of CS. A priori (17) can take (Y)Z to be */kI/*, hence the final output [*kiwt*], or it can take (Y)Z to be */IU/*, hence [*kyut*]. We will assume that it takes the first analysis, and more generally, that

(26) during each pass corresponding to a step of the sonority scale, CS operates iteratively from left to right.[22]

The following forms all contain a sequence ABC where B and C belong to the same step of the sonority scale. In each line the form on the left is the attested one, where the syllabification is (AB ')C, in conformity with (26), and the unacceptable form on the right has instead the syllabification A(BC ').

(27)	*/rks–x/*	*R . kSx*	*	*Rk . sX*	'I hid'
	/baIn–n/	*ba . yNn*	*	*bay . nN*	'they (m.) appear'
	/I–sUfU–IIt/	*isufuyyt*	*	*isufwiyt*	'let him illuminate'[23]
	/ldI–III/	*Ldiyyi*	*	*Ldyiyi*	'pull me!'[24]

(26) cannot be the complete story, however. Counterexamples such as the following suggest that some other rule or principle is at play. For */Ugm–n/* 'they (m.) drew (water)' (26) predicts *u . gMn* as the only correct syllabification; however *ug . mN* is also possible. For */I=t–! bdrI–n/* 'for the cockroaches' (26) predicts *i . tBd rin,* whereas the only possible syllabification is *it . bD . rin* (*it . əb(ə)D .rin* in a narrower transcription, cf. section 3). We leave these for further research. On (26) and the geminates, cf. section 5.

Finally, we must mention the existence of a class of morphemes which behave exceptionally with respect to CS. All of these contain a HV that does not show up as a peak in certain contexts where CS predicts it should. One finds pairs such as

(28)	*suy*	'let pass!'	*zwi*	'beat down!'
	lur	'give back!'	*lwR*	'run away!'
	t–urti–t	'garden', f.	*t–wRta–t*	'kind of feline', f.[25]

The lexical representation of the root in the second member of each pair must induce the back HV to behave exceptionally with respect to CS. These forms are dealt with in Elmedlaoui (1985).

3. SYLLABIC CONSONANTS

Since well-documented studies of languages with a rich array of syllabic consonants, especially obstruents, are not a common occurrence in the phonological literature,[26] we will pause to give a few phonetic details about the syllabic consonants of ITB.

In our phonetic transcriptions, the indications pertaining to syllabicity were gathered from the judgments of one of us (ME) *qua* native speaker. For each form transcribed, two questions were asked: 1) how many syllables are there? and 2) where is the peak of each syllable located? When asked such questions regarding French, the native speakers of French seem to have intuitions of a more or less uniform degree of immediacy and sharpness for all forms, provided the exact nature of the judgments sought from them has been made clear to them.[27] For ITB on the other hand, ME's intuitions vary in immediacy and sharpness depending on the phonological make up of the forms subjected to his judgment. Elsewhere in this article, unless stated otherwise, we have used as our data only forms which are representative of sequence types about which ME's intuitions are clearcut and consistent over time. But here are a few examples where they are not.

Although ME has a clear intuition that */nšf–at/* 'skin! (pl.)' and */!rzzm–at/* 'open! (pl.)' must count as two syllables when pronounced after a pause, in that environment he cannot decide where the peak of the first syllable is located, i.e. he is unable to chose between *Nš* and *nŠ*, between *!Rzz* and *!rZz*. He has no doubts that */ss–rks–x–t/* 'I hid him'[28] contains two syllables and that the peak of the first is on *r*, but he is unsure where to locate the peak of the second. He is positive that in */t–!ngd–t/* 'you drowned', which is pronounced *!tN(ə)gətt, n* is a syllabic peak, but he cannot tell whether *gətt* counts as a second syllable.

Cases such as the above constitute a few well circumscribed areas of uncertainty. It is however noteworthy that there exist such areas in ITB whereas there are none in French.[29]

Judgments about the location of syllable boundaries were not examined. Whenever we represent a form as a sequence of syllables, the location

of the syllabic peaks in that form reflects an empirical observation, whereas the allocation of the nonsyllabic segments between the onset and coda positions of the various syllables reflects the predictions made by our analysis.

Besides the vowels *a, i, u*, descriptions of other Berber dialects record the existence of reduced vowels.[30] The reader may wonder whether our transcribing certain consonants as syllabic is not just another way of recording the existence of a short vowel next to those consonants, i.e. whether, when we are transcribing, e.g. /*t–stI*/ 'she selected' as *tSti*, a more precise rendition should not be [*təsti*] or [*tsəti*].

There do indeed occur at the phonetic level ultra-short transitional vowels, and these are not indicated in our transcriptions. The first thing to notice about them is that they occur only adjacent to voiced consonants. No voiced vocoid, however short, can be heard in the first syllable of *tS. ti* or in the second syllable of *u. tXk* 'I struck you' (from /*Ut–x–k*/), and pronouncing one there is grossly incorrect. Some utterances must be voiceless throughout, cf. e.g., *tF. tKt*, 'you suffered a sprain'. In syllables with only voiceless consonants, there is nothing in what one hears which could suggest the existence, adjacent to the syllabic consonant but not to the others, of a voiceless vowel. There is no audible difference, at least in the way articulation moves from one consonant to the next, when one compares *tst* in ITB *tS. ti* and in English *cut sticks*, or *kst* in ITB *tRkSt* 'you hid' (/*t–rks–t*/) and in English *next*.[31]

Except in certain homorganic sequences, as when *t* is followed by *n*, ITB stops have a very clearly marked oral release, before a pause as well as before another consonant. Between the release of a consonant and the onset of the closure of another which immediately follows, then, there occurs a very short transitional vocoid which sounds like a slight aspiration if the glottis is not vibrating, and as a vowel if it is. Although ME is to some extent able to consciously manipulate other superficial aspects of his pronunciation, such as emphatic articulation or voicing in consonant clusters, he has no control over these ultra-short transitional vowels. As a matter of fact, in most cases he finds it quite difficult to perceive them, and so does the other coauthor in many cases. There is no doubt in our minds that the occurrence of these vowels is predictable in all environments at a very late stage in the derivations, but a systematic study has yet to be made. From the restricted data we have gathered it is already clear that three factors play an important role: voicing, point of articulation, and syllabic structure as predicted by CS.

Voicing has already been mentioned above: transitional vowels are always adjacent to a voiced consonant. We have found transitional vowels only between consonants which differ in point of articulation. One may sometimes hear one between *s* and *b* in *tS. bγ't* 'you painted' (/*t–sbγ–t*/),

but never between *!s* and *!d* in *!tS . dRt* 'you let fall' (*/t–s–!dr–t/*). Other examples of transitional vowels are found in *R . gLx* 'I locked' (*/rgl–x/*) and *ixNg* 'he strangled' (*/I–xng/*), for which more precise transcriptions would be [*RgLəx*], [*ixNəg*]. When [*RgLəx*], for instance, is pronounced at the end of an utterance with a high rising intonation (cf. section 4) the high rising tone is heard as much on the [*l*] as on the following vowel. */I–xng–t/* 'he strangled him', is pronounced *i . xNgt*, or more precisely [*ixNəgət*]. This form illustrates the fact that not every transitional vowel corresponds to a different syllabic peak. So does the monosyllabic form *ĩškd* 'stub, sg.' (from */Iškd/*), more precisely [*ĩkəd*].

As for the relevance of syllable structure for predicting the distribution of transitional vowels, it is illustrated by */I–xng–a–s/* 'he strangled for him', which is *ixNgas*, with no transitional vowel on either side of *n*. In the f[illegible]s *ixNg* and *ixNgt* mentioned above, where a transitional vowel occurs between *n* and *g*, these consonants belong to the same syllable. In *ixNgas* on the other hand they belong to different syllables and no transitional vowel occurs. This is not to say that transitional vowels never occur between heterosyllabic consonants, however, witness *tSbγ 't* (cf. above) or *i . šNn . qas* 'he wrung (someone's neck) for him' (*/I–šnnq–a–s/*), where a transitional vowel occurs between *n* and *q*.

Between a HV onset and a syllabic sonorant consonant, as in the forms in (13), one hears a short, lax, somewhat centralized, homorganic analogue of the HV, i.e. [*ɪ*] after [*y*] and [*ʊ*] after [*w*]. For instance the following examples illustrate the contrast between *yil* and *yL* ([*yɪl*]) and that between *wul* and *wL* ([*wʊl*]).[32]

(29) a. *aristayilqqayd* */ar–I–staI=I=lqqaId/*

b. *aristayLqqayd* */ar–I–staI=lqqaId/*

c. *innawulmis* */I–nna=U–UlmIs/*

d. *inawLmas* */I–naUl=ma–s/*

Recent discussions dealing with other Berber dialects (cf. fn. 7) assume that in these dialects all syllabic peaks are full vowels or shwas. The full vowels are the reflexes of segments already present in the phonological representations, while the shwas are inserted in order to break consonant clusters which would otherwise remain unsyllabified. Could syllabification in ITB not be accounted for along similar lines, with a late rule deleting the epenthetic shwas and transferring their syllabicity to a neighbouring consonant? We leave it to the interested readers to see for themselves how unpromising the propects are in that direction. We will simply show that at

least one phonological process treats consonantal peaks on a par with nonconsonantal ones.

In the lexical representations of ITB emphatic articulation is demonstrably a property of individual segments. (cf. Elmedlaoui 1985). But at the phonetic level it spans strings of segments. If the underlying representation of a word contains an emphatic segment all the segments in that word have a uniform degree of emphatic articulation at the phonetic level. At the phonetic level, one may simply classify words as non-emphatic and emphatic. The influence of an emphatic word on the surrounding words in the utterance is independent of the location of the emphatic consonant(s) in the underlying representation of that word. Furthermore, at the phonetic level, an onset and the following peak always agree in emphasis. Both are emphatic, or else neither one is. This is true of all syllables, in particular of those whose onset and peak belong to different words. For instance, when an emphatic word ending in a consonant is followed by a non-emphatic one beginning with a vowel, that vowel becomes emphatic.[33]

(30) *yazdisdu* /*I–!az–d=I–sdu*/ 'he came near and leaned on (something)'

The same spread of emphasis to the right occurs no matter what the initial segment of the second word is, as long as that segment is syllabified as a peak together with the last segment of the first word. In (31) the *s* is syllabic and becomes emphatic:

(31) *yiwitittSdarun* /*I–IUI=t–!It–t=s=dar–Un*/
'he feels like going to your place'[34]

Notice now that in (30) the *s* is not pronounced emphatic. The difference between the non-emphatic *s* in (30) and the emphatic one in (32) is a clearly perceptible one.

(32) *ħasdisdumn* / *ħa=!sdIs=dUm–n*/ 'here are six that last'[35]

The non-emphatic pronunciation of *s* in (30) is a particular case of the following generalization: when three segments A, B, C occur in a configuration A=BC, where A belongs to an emphatic word and where A and B are syllabified together as onset and peak, emphasis spreads to B but not to C, even in cases such as (30) where C presumably belongs to the same syllable as A and B. However that generalization may be accounted for, the point about it is that its formulation implies that at the stage of the phonological derivations where the mechanism responsible for empha-

sis spread operates, *s* in (31) must fill the same structural position as *i* in (30), i.e. it must be a peak. If at that stage of the derivations the antepenultimate syllable in (31) were represented as *təs* with a peak vowel to be deleted later on, then the mechanisms responsible for emphasis spread would have to be designed in such a way as to make *s* emphatic in *təs* but not in *dis* in (30), i.e. their operation in such cases should be made sensitive not only to structural positions such as onset and peak, but also to the feature specifications of the peak when the peak is a vocoid.

4. PREPAUSAL ANNEXATION

(33)	a.	*igidR*	b. *igidr*	*/IgIdr/*	'eagle'
		yurM	*yurm*	*/I–Urm/*	'he tasted'
		RgL	*Rgl*	*/rgl/*	'lock!'
		ugLxkM	*ugLxkm*	*/Ugl–x–km/*	'I hung you (fem.)'
		dumN	*dumn*	*/dUm–n/*	'they (m.) last'

In all the forms in (33)a the peak of the last syllable is a consonantal sonorant. The pronunciations recorded in (33)a are as predicted by CS. They are the only possible ones before another word whose first segment is not syllabic.[36] Before a pause, however, there is free variation with the pronunciations in (33)b, where the final sonorant is not syllabic. ME's syllabicity judgments correlate with audible differences. ITB has an intonation which is used in questions to convey a nuance of puzzlement, and which ends in a high rising tone (HR) preceded by a low tone. The HR is always assigned to the last tone-bearing unit of the utterance. The last tone-bearing unit of an utterance is the last syllable with a voiced peak, i.e. the last syllable in the forms above. At the end of an utterance, when */IgIdr/*, for instance, is pronounced as in (33)a, the two vowels carry a low tone and the HR is heard on the final consonant. If it is pronounced as in (33)b, only the first *i* carries a low tone, and the HR is heard on the second *i*. Also, *dr* sounds longer than *gi* in (33)a whereas the opposite is true in (33)b. Similar observations can be made with other intonations. Let us posit a rule of Prepausal Annexation, which applies after CS and changes a final core syllable into a coda to the preceding syllable.

(34)

before a pause

Words ending in a vocoid are not subject to prepausal annexation. (34) requires the prepausal syllable to be an open one. Closed syllables always retain their syllabicity, in front of a pause or elsewhere. Compare (33) and the following, which retain the same number of syllabic peaks no matter what follows.

(35)	*i . ga . dRn*	*/Igadr–n/*	'eagles'
	tu . rMt	*/t–Urm–t/*	'you tasted'
	R . gLx	*/rgl–x/*	'I locked'
	u . gLx . tNt	*/Ugl–x–tnt/*	'I hung them (f.)'

In words where CS predicts a final open syllable with an obstruent as a peak, that prediction is borne out when another word follows.[37] This is illustrated below.

(36)	*! is . bu . kD . ba . bas*	*/I– ! sbUkd=baba–s/*	'he poked his father eye out'
	ir . kS . ba . bas	*/I–rks=baba–s/*	'his father hid'
	if . tK . ba . bas	*/I–ftk=baba–s/*	'his father suffered a sprain'
	is . tγ ' . tif . lut	*/I–stγ=t–IflU–t/*	'he cracked the door'

Before a pause, however, the two final consonants never count as a syllable. Prepausally, *! isbukd* can only have two syllables, and *irks, iftk, istγ* can only have one. The application of rule (34) is obligatory when the last segment is an obstruent, and it is optional when that segment is a sonorant.

As formulated in (34) the rule should operate no matter what the syllable preceding the prepausal syllable. There are however restrictions on that syllable, witness the fact that the final *m* cannot lose its syllabicity in */ra–t–kšm/* 'she will enter', where the ouput of CS is *ra . tK . šM*. We leave this question for further research.

5. GEMINATE SEGMENTS

ITB has a length contrast for both consonants and vowels. There are two sources for long segments. Some are the phonetic reflexes of underlying long segments, while others arise when identical segments happen to occur on both sides of a morphological boundary. Both types are often (but not always – cf. fn. 46) indistinguishable at the phonetic level. For instance */Igr–a–nn/* 'that field' and */Igran–n/* 'lofts' are homophonous.[38]

As far as syllabification is concerned, all occurrences of a long segment

must be regarded as a sequence of two units. [*gru*] and [*gr : u*] are the perfective and imperfective form of a verb meaning 'to pick up'. The perfective has a regular *r* and is monosyllabic, whereas the imperfective has a long *r* and is disyllabic. Positing an underlying contrast between /*grU*/ and /*grrU*/ accounts for both differences at once. CS syllabifies /*grrU*/ as *gR . ru*. Here are other similar pairs.

(37)	*gnu*	*gNnu*	'sew'
	žlu	*žLlu*	'lose'
	gzi	*gZzi*	'vaccinate'

Another reason to consider homomorphemic geminates as sequences of two units is the fact that words which end in a syllabic homomorphemic geminate are not subject to prepausal annexation. For instance, whereas in prepausal position /*I–ml*/ 'show, 3 sg. aorist', can be either disyllabic (*i . mL*) or monosyllabic (*iml*), /*Imll*/ (a place name) can only be disyllabic (*i . mLl*). Whereas in the same context /*I–Ukr*/ 'he stole' can be either *yu . kR* or *yukr*, /*I–Ukrr*/ 'he drags' must be pronounced dissyllabic: *yu . kRr*. Whereas /*skar–n*/ 'they (m.) are doing' can be either *ska . rN* or *skarn*, /*skar–nn*/ 'do over there!' must be dissyllabic: *ska . rNn*. At the end of prepausal /*Imll*/, /*I–Ukrr*/ and /*skar–nn*/ one simply hears a long steady-state syllabic consonant. However our syllabification rules tell us that the first half in the geminate functions as a syllabic peak and the second as a coda, and we have made our transcriptions accordingly.

Geminate HV's, whose behavior in syllabification is similar to that of consonants, are manifested as long vowels with no discernible diphthongization when they function as a peak followed by a coda. For instance, the perfective form of the verb meaning 'to wait', which is /*!šUUr*/, is phonetically *!šu . wR*, as predicted by CS.[39] The alternate pronunciation resulting from the operation of the rule of prepausal annexation is [*!šu : r*], which we transcribe as *!šuwr* so as to make its syllabic structure more conspicuous. In all our transcriptions in this article, whenever *uw* and *iy* represent homosyllabic sequences they must be read as [*u :*] and [*i :*].[40]

The forms below illustrate the pervasive parallelism between homomorphemic geminate HV's and homomorphemic geminate consonants. ITB verbs whose perfective stem is /PQQR/ (columns I, II) have /*tt*–PQQ*a*R/ as their imperfective stem (column III).

	I	II	III	
(38)	/*!xlls*/	*!xLls*	*!ttxL . las*	'pay'
	/*sxxn*/	*sX . xN*	*ttsX . xan*	'dip (in sauce)'
	/*bddl*/	*bD . dL*	*ttbD . dal*	'exchange'

/!mIId/	!miyd	!ttmi . yad	'be bad luck'
/!zIIr/	!zi . yR	!ttzi . yar	'tighten'
/fUUt/	fuwt	ttfu . wat	'spend'
/ħUUl/	ħu . wL	ttħu . wal	'to worry'

Geminates can also appear in complex codas:

(39)	a.	!az . munnk	/!azmu–nn–k/	'your meadow'[41]
	b.	ill . mas	/I–llm–a–s/	'he spun (e.g. wool) for him'[42]
	c.	tayy . dart	/t–a–IIdar–t/	(a woman's first name)[43]
	d.	!aššˇ . bar	/!aššbar/	'barricade'

Combining the length contrast in the vowel with that in the following coda yields a four-way contrast which is illustrated below. All four utterances are disyllabic.

(40)	innans	/I–nna=ns/	'he said: spend the night!'[44]
	tamanns	/tama–nn–s/	'near him'[45]
	bužmaans	/bužmaa=ns/	'spend the night, Boujema'
	bužmaanns	/bužmaa–nn–s/	'his Boujema'

Geminates occurring in complex codas are in contradiction with the predictions made by (26). In (39)a, for instance, (26) predicts *!az . mu . nNk*, since in the input to the nasal pass of CS the sequence /nn/ meets the conditions for being analyzed as a sequence YZ by subrule (19). There is no general prohibition in ITB against making a core syllable out of two identical segments, witness the third syllable in *is . mu . nNt* 'did they (f.) get together?', from /Is=mUn–nt/.[46] The prohibition concerns only sequences where the two identical segments belong to the same morpheme:

(41) In ITB, a geminate is never realized as a sequence onset plus peak when both halves belong to the same morpheme.

Here are other examples where the application of (26) would yield a representation which runs counter to the empirical generalization (41). The correct pronunciation is on the left and that predicted by (26) is on the right.

(42)	/i–žara–IIt/	'let him search' (cf. fn. 23)	ižarayyt	*ižarayit
	/I–UIIl/	'he flew away'	yuyyl	*yuyil
	//IIdar/	(a man's first name)	iydar	*yidar
	/aIIIs/	'horse'	ayyis	*ayiys
	/I–mla–III/	'he showed to me (cf. fn. 24)	imlayyi	*imlayiy

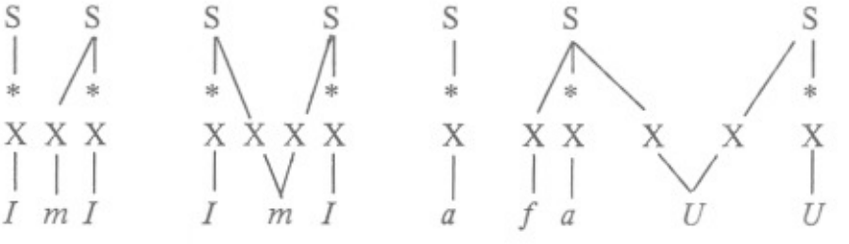
/*t–aUUUrI*/	'work'	*tawwuri*	**tawuwri*
/*afaUUU*/	'blanket'	*afawwu*	**afawuw*

Until now we have assumed that the units associated with S nodes by the syllabification rules are the segments themselves. Suppose instead, following various recent proposals,[47] that those units are rather empty timing units, call them X, which constitute a kind of timing skeleton for the utterances. In most cases the association between the segments and the X's is one to one; but geminates are segments which correspond to two X's. Here are for instance the lexical representation of *imi* 'mouth', *immi* 'mummy' and *afawwu* 'blanket'.

(43)

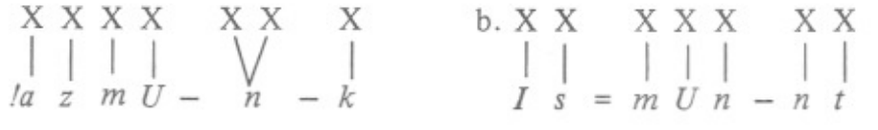
Here are the corresponding phonetic representations.

(44)



The phonological representations which we gave above as /*!azmU–nn–k*/ and /*is=mUn–nt*/ are now to be represented as below.

(45)



In (45)a the geminate in the suffix is a single column of feature specifications linked to two X positions, since both halves of the geminate belong to the same morpheme. We assume that all geminates both halves of which belong to the same morpheme must be so represented:

(46) No ITB morpheme may contain

(where F is a set of feature specifications).[48]

In (45)b, since the lexical representation of the root */mUn/* and that of the suffix */nt/* must be specified independently of one another in the grammar, the representation contains two occurrences of the set of feature specifications characteristic of */n/*, the first of which belongs to the lexical representation of the root *mUn*, and the second, to the lexical representation of the 3 f. pl. suffix *–nt*. Generalization (41) can now be taken as a consequence of the conjunction of (46) and the following.

(47)

is ill formed

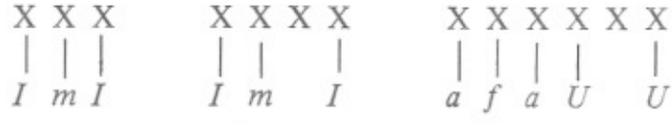
The last four examples in (42) contain sequences of three successive positions with identical feature specifications. These must be analyzed as a geminate followed by a non-geminate, as in the lexical representation of *afawwu* in (43). If they were analyzed instead as a non-geminate followed by a geminate the realization of that geminate as a sequence onset-peak would constitute a violation of (47). More generally, configuration (48)a is allowed in lexical representations, but not (48)b. (46) is repeated here as (48)c for the sake of comparison.

(48) a.(OK) b.(*) c.(*)

(47) and (48) suggest some fundamental assymmetry in the nature of lexical geminates in ITB. It is as though their right half was in some sense subordinated to their left half.

One way to develop this idea is the following. Suppose that the lexical representations of *imi, immi* and *afawwu* are those below instead of those in (43).

(49)

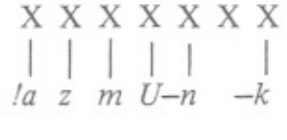


In order to be able to derive the phonetic representations in (44) our grammar must contain a rule which links any unassociated X to the melodic segment on its left.[49]

(50)

Assume that (50) applies only after all the subrules of CS have applied. Consider for instance what will happen in the derivation of / *!azmU–nn–k*/, whose underlying representation is now

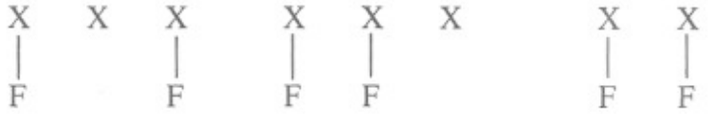
(51)



For an X to be made into a peak by one of the subrules of CS, that X must be linked with the set of feature specifications required by the subrule in question. For instance, in order for an X to be made into a peak through the operation of CS(N), that X must be linked to a segment containing the specification [+nasal]. Since (50) applies only after CS, throughout the operation of CS, the penultimate X in (51) is not linked to any column of feature specifications, and hence it cannot be made into a peak by any subrule of CS. This accounts for (47). On the other hand, the absence of any feature specifications attached to an X does not prevent that X from being made into an onset by CS, since the only thing that is required of an X for that X to be eligible as an onset, is that it immediately precede a peak. Nothing will prevent the penultimate X in *immi* and *afawwu* in (49) from becoming onsets during the HV pass of CS.

With this new mode of representation for lexical geminates, (48) becomes

(52) a.(OK) b.(*) c.(*)



NOTES

1. These vowels have variants conditioned by neighbouring consonants, but since these are not relevant here we will not represent them in our phonetic transcriptions. In this article "consonant" is always equivalent to [+consonantal] in the sense of Chomsky and Halle (1968). The consonants of ITB are: *b, m, f, t, d, n, s, z, š, ž, k, k^w, g, g^w, x, x^w, γ, $γ^w$, q, ħ, ḥ, ʕ, l, r.* γ and $γ^w$ represent voiced uvular fricatives. Syllabic consonants are represented by capitals (e.g. *N* stands for a syllabic *n*) except for *γ, h, ḥ* and *ʕ*, where syllabicity is represented by an apostrophe. The voiceless consonants are unaspirated; the voiced consonants have glottal vibration throughout the closure period and sound like those of French. There exist lexical geminates corresponding to *a, i, u* and to all the consonants except γ and $γ^w$. When prefixed to the transcription of a word the exclamation point indicates that at the phonetic level all the segments of that word have emphatic articulation; when prefixed to the phonological representation of a morpheme it indicates that one or more segments in that representation are emphatic. We will use the following abbreviations: sg., singular; pl., plural; m., masculine; f., feminine; gen., genitive; dat., dative.
2. *nn–* gen., *-a-* dat.
3. Cf. Kiparsky (1979), Leben (1980), Anderson (1982), Cairns and Feinstein (1982), Clements and Keyser (1983), Kaye and Lowenstamm (1984), Selkirk (1984).
4. Although this fact is usually taken for granted, one may wonder why things could not be otherwise.
5. For some recent proposals cf. Kahn (1976), Lowenstamm (1981), Cairns and Feinstein (1982), Steriade (1982, 1984).
6. Cf. Halle and Vergnaud (1978/1981), Selkirk (1982), Harris (1983), Clements and Keyser (1983), Kaye and Lowenstamm (1984).
7. For such an approach to syllabification in Berber, cf. Vergnaud and Halle (1978/1981), Kenstowicz, Bader and Benkeddache (1982), Guerssel (1983b).
8. From /*ra–t–rgl–t*/ 'you will lock'; *ra* future, *t– . . . –t* 2 sg.
9. Other Berber dialects seem to have a similar property, cf. Saib (1978), Guerssel (1983b).
10. On the universal sonority scale, cf. Hooper (1976), Bell and Hooper (1978), Kiparsky (1979), Selkirk (1984), Steriade (1982). Steriade argues that sonority scales may vary across languages and proposes that they all be derived from one fixed hierarchy of binary distinctive features.
11. The ungrammaticality of *tluat* cannot be explained by a general prohibition against words beginning in *tlV*, for there is no such prohibition in ITB, witness *tlult* 'you were born', from /*t–lUl–t*/.
12. Except in words containing an exceptional morpheme of the type exemplified in (28), e.g. *il . wR* 'he ran away'. Like all the others in ITB, these forms always comply with (10).
13. Such syllables are exceptions to the often noted tendency for the peak of a syllable to coincide with its sonority maximum (cf., e.g. Bell and Hooper 1978). On the other hand, ITB has no syllables where the coda is more sonorous than the peak. This assymmetry may be taken as one bit of evidence suggesting that the peak is more closely related to the coda than to the onset, as proposed, e.g., in Halle and Vergnaud (1980) or Selkirk (1982). For different views on the internal structure of syllables, cf. Clements and Keyser (1983).
14. /*t– . . . –t*/ 2 sg.; /*–a–s*/ 3 m. sg. dat.; /*ra–*/ future; /*I–*/ 3 m. sg.; /*–tn*/ 3 m. pl. object.
15. Pronounced *tlurtNt*, from /*t–lUr–tn–t*/ 'she gave them (f.) back'; *t–* 3 f. sg.,

–tn–t 3 f. pl. object. The morpheme boundaries, which are irrelevant here, are left out from the main text for the sake of simplicity.

16. Onsetless syllables with an oral stop as a peak must be excluded from the phonetic representations of ITB. On how this should be done, cf. Elmedlaoui (1985). Making the final *t* the peak of an onsetless syllable would furthermore result in a violation of (25) below.

17. On core syllables where Y is more sonorous than Z, cf. (13) and fn. 13.

18. /*I*/ 3 m. sg.; /*t*/ 3 f. sg.; /*akk*^{w}/ 'all, even'; /*x*/ 1 sg.; /*k*/ 2 m. sg. object; /*ma*/ 'what?'; /*ra*/ future; /*t*– . . . –*t*/ 2 sg.; /*g*/ 'to be'; in a narrower transcription where ultrashort transitional vowels are noted (cf. section 3) these forms are: *iγmL, isləm, tzMt, tMzħ, tx(ə)Znakk*^{w}, *təbXlakk*^{w}, *utXk, maratəgt, ratKti, tFtKt.*

19. Cf. Clements and Keyser (1983), Steriade (1982, 1984) and the references in fn. 7.

20. Postpausal syllables which are phonologically onsetless can (but need not) be pronounced with an initial glottal stop: [ʔikru], [*ʔRgL*].

21. It is not uncommon for languages to be more liberal with regard to the syllable types that they allow at the two ends of the domains over which syllabification is defined. For another instance of this in ITB, cf. section 4.

22. In Steriade 1984 the "CV rule", which builds CV syllables over the C and V slots of a CV skeleton *à la* Halle and Vergnaud (1980), operates from left to right. Although (26) constrains the operation of CS in terms of left and right, we believe that (26) is not concerned with left to right ordering *per se*, but rather with favoring applications of CS that maximize the sonority differences between the terms Y and Z in (15).

23. /*IIt*/, injunctive. Compare with *ilasiyt* 'let him shear' (/*I–las–IIt*/).

24. /*III*/, 1 sg object. Compare with *lasiyi* 'crop my hair!' (/*las–III*/).

25. This is a bound state form. The corresponding free state form is [*tawRtat*]. On the phonology and morphology of the bound state, cf. Basset (1932), Guerssel (1983a), Kenstowicz, Bader and Benkeddache (1982).

26. For a general survey, cf. Bell 1978. On Pacific Northwest Indian languages cf. Hoard 1978. There are on record languages with syllabic consonants that must already appear as such at the most abstract level of representation where syllabic structure is present. One of these is Bai, a "monosyllabic" language of Southern China whose syllables are all of the form C(G)V (G for glide). Besides *a, o, u,* etc., the voiced labiodental fricative can appear in the V position behind most consonants, hence syllables such as *tv, kv, fv, sv, nv, lv,* etc.

These syllables are tone-bearing units like any others in the language. A similar situation is also found in neighboring dialects of Chinese. Cf. Dell (1981) and references therein.

27. I.e. once they have been made aware of the difference between counting syllables in written words and in spoken ones, of the differences between the pronunciation in use in everyday speech and those used in singing and in reading poetry, and last but not least, once they have been made to realize that, even within the bounds of one style of speech, many forms can be pronounced in more than one way.

28. /*ss*/ causative, /*x*/ 1 sg., /*t*/ 3 m. sg. object.

29. Most of those involve syllabic consonants (especially obstruents), i.e. configurations which have no analogues in French about which one could examine the judgments of the native speakers of French (French does not allow syllabic consonants, even at the most superficial level, *pace* Bell 1978). One may speculate whether one would not find similar areas of uncertainty in the judgments of the native speakers of any language with syllabic consonants.

30. Cf., e.g. Applegate (1958), Destaing (1920).
31. The *s* sounds perhaps longer in the ITB sequences than in the English ones.
32. a) 'he selects for the chief': /*ar*/modal, /*I*/ 3 m. sg., /*I*/ dative; b) 'the chief selects'; c) 'the untidy one said': /*U*/ bound state prefix; d) 'he took care of his mother' /*s*/ 3 m. sg. possessive.
33. A dot under a segment indicates emphatic articulation. /*I*/ 3 m. sg., /*d*/ in direction of the speaker.
34. Literally 'he brought the eye to your place'; /*IUI*/ 'bring, take away'; /*t–! It–t*/ 'eye', /*s*/ 'toward', /*dar–Un*/ 'your house'. This form is homophonous with /*I–IUI–t=! Itts=dar–Un*/ 'he fell asleep in your house' (lit. 'sleep took him away in your house', /*! Itts*/ 'sleep').
35. /*ħa*/ 'here is . . . ', /*! sdIs*/ 'six', /*dUm*/ 'to last', /*n*/ 3 m pl.
36. As in *igidRda ! zran* 'the eagle that they (m.) saw' (/*IgIdr=da=! zra–n*/), /*da*/ 'that', /*n*/ 3m. pl. If the first segment in the next word is syllabic the final consonant becomes an onset, as in *yur . ma . man* 'he tasted the water' (/*I–Urm=aman*/).
37. And when furthermore that word begins with a nonsyllabic segment. When that segment is syllabic, cf. the preceding footnote.
38. /*–a–nn*/ 'that'; 'loft, sg.' is /*agran*/.
39. Its imperfective is *! ttšuwar*, cf. (38).
40. With one exception: After *ħ*, *i* is lowered to [ε]. When /*II*/ occurs after *ħ*, only the first HV is lowered, and the sequence is realized as [ε*y*], as for instance in *tašLħεyt* 'Tashlhiyt' (/*t–ašlħII–t*/), *ħεyd* 'step back' (/*ħIId*/).
41. *nn* genitive; *k* 2 sg. object.
42. Cf. *il . lM* (prepausally, also *illm*), from /*I–llm*/ 'he spun' which is distinct phonetically from *i . lM* (prepausally, also *ilm*) 'skin', from /*Ilm*/.
43. Contrast this with *tay.dRt* 'ear (wheat)' (/*t–aldr–t*/), with a non-geminate coda in the first syllable.
44. *nna* 'to say'; *ns* 'to spend the night'.
45. *tama* 'side'; *nn* genitive; *s* 3 m. sg.
46. *is*, interrogative; *nt*, 3 f. pl. Contrast trisyllabic *is . mu . nNt* with disyllabic *! az . munnk* in (39)a. Setting aside the differences in the last consonant and in emphatic articulation, *–mu . nNt* (two syllables) and *–munnk* (only one) sound very much alike to an untrained ear. In particular, both contain a long steady-state *n*. However, intonational facts go hand in hand with ME's syllable count. In matter of fact requests for information, ITB speakers commonly use a tune which ends in a mid tone (M) followed by a high falling tone (HF). When *is.mu.nNt* occurs at the end of an utterance carrying that tune, *mu* carries an M and the following long *n* carries a HF, in the same way as in *is . sa . lan* 'are they (m.) through? (/*Is=sala–n*/) *sa* carries an M and *lan* a HF. When *! az . munnk* occurs in the same context, on the other hand, *! az* carries the M, and the HF is carried by the sequence *! munnk* taken as a whole.
47. Cf. Clements and Keyser (1983), Halle and Vergnaud (1980), Leben (1980), McCarthy (1979, 1981), Prince (1984).
48. This is reminiscent of the "Obligatory Contour Principle", about which cf. Leben (1973), McCarthy (1981).
49. Angoujard (1984:193) also suggests that long consonants be represented as above.

REFERENCES

Anderson, S.R. 1982. The analysis of French Schwa: Or, how to get something for nothing. *Language* 58:534-73.

Angoujard, J.–P. 1984. Aspects d'une micro-prosodie (le modèle arabe). Doctorat d'Etat, Université de Paris VIII, Saint-Denis.

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

Aronoff, M., and R.T. Oehrle, eds. 1984. *Language Sound Structure*. Cambridge, Mass.: MIT Press.

Basset, A. 1932. Note sur l'état d'annexion en berbère. *Bulletin de la Société de Linguistique de Paris* 33:173-74.

Bell, A. 1978. Syllabic consonants. In *Universals of Human Language. Vol. 2: Phonology*, ed. J. Greenberg, pp. 153-201. Stanford, Cal.: Stanford University Press.

Bell, A. and J.B. Hooper, eds. 1978. *Syllables and Segments*. Amsterdam: North-Holland.

Bell, A. and J.B. Hooper. 1978. Issues and evidence in syllabic phonology. In Bell and Hooper 1978:3-22.

Cairns, C.E., and M.H. Feinstein. 1982. Markedness and the theory of syllable structure. *Linguistic Inquiry* 13:193-225.

Chomsky, N., and M. Halle. 1968. *The Sound Pattern of English*. New York: Harper and Row.

Clements, G.N., and S.J. Keyser. 1983. *CV Phonology: A Generative Theory of the Syllable*. Cambridge, Mass.: MIT Press.

Dell, F. 1981. *La langue bai: phonologie et lexique*. Paris: Editions de l'Ecole des Hautes Etudes en Sciences Sociales.

Destaing, E. 1920. *Etude sur la tachelhit du Sous. Vocabulaire français-berbère*. Paris: Leroux.

Elmedlaoui, M. 1985. Le parler berbère chleuh d'Imdlawn: segments et syllabation. Doctorat de Troisième Cycle, Université de Paris VIII, Saint-Denis.

Guerssel, M. 1983a. A phonological analysis of the construct state in Berber. *Linguistic Analysis* 11:309-30.

———. 1983b. Glides in Berber and syllabicity. MIT, Cambridge, Mass.

Halle, M., and J.–R. Vergnaud, 1980. Three-dimensional phonology. *Journal of Linguistic Research* 1:83-105.

Harris, J.W. 1983. *Syllable Structure and Stress in Spanish: A Non-Linear Analysis*. Cambridge, Mass.: MIT Press.

Hoard, J.E. 1978. Syllabication in Northwest Indian Languages, with remarks on the nature of syllabic stops and affricates. In Bell and Hooper 1978:59-72.

Hooper, J.B. 1976. *An Introduction to Natural Generative Phonology*. New York: Academic Press.

Kahn, D. 1976. *Syllable-Based Generalizations in English Phonology*. Bloomington, Ind.: Indiana University Linguistics Club.

Kaye, J.D., and J. Lowenstamm. 1984. De la syllabicité. In *Forme sonore du langage*, ed. F. Dell, D. Hirst and J.–R. Vergnaud, pp. 123-59. Paris: Hermann.

Kenstowicz, M., Y. Bader and R. Benkeddache. 1982. The Phonology of State in Kabyle Berber. University of Illinois, Champaign.

Kiparsky, P. 1979. Metrical structure assignment is cyclic. *Linguistic Inquiry* 10: 421-41.

Leben, W.R. 1973. Suprasegmental Phonology. Ph.D. diss., MIT, Cambridge, Mass.

———. 1980. A metrical analysis of length. *Linguistic Inquiry* 11:497-509.

Lowenstamm, J. 1981. On the maximal cluster approach to syllable structure. *Linguistic Inquiry* 12:575-604.

Mazaudon, M. 1973. *Phonologie tamang (Nepal)*. Paris: SELAF.

McCarthy, J.J., 1979. *Formal Problems in Semitic Phonology and Morphology*. Ph.D. diss., MIT, Cambridge, Mass.

———. 1981. A prosodic theory of nonconcatenative morphology. *Linguistic Inquiry* 12:373-418.

Prince, A.S. 1984. Phonology with tiers. In Aronoff and Oehrle 1984:234-44.

Saib, J. 1978. Segment organization and the syllable in Tamazight Berber. In Bell and Hooper 1978:93-104.

Selkirk, E.O. 1982. The syllable. In *The Structure of Phonological Representations (Part II)*, ed. H. van der Hulst and N. Smith, pp. 337-83. Dordrecht: Foris.

———. 1984. On the major class features and syllable theory. In Aronoff and Oehrle 1984:107-36.

Steriade, D. 1982. Greek Prosodies and the Nature of Syllabification. Ph.D. diss., MIT, Cambridge, Mass.

———. 1984. Glides and vowels in Romanian. To appear in Proceedings of the 10th Meeting of the Berkeley Linguistics Society, Department of Linguistics, University of California, Berkeley.

Vergnaud. J.–R., and M. Halle. 1978. Metrical structure in phonology (A fragment of a draft). Revised 1979 and 1981. MIT Cambridge, Mass.

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