1981

Stress, pretonic strengthening, and syllabification in Tiberian Hebrew

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MIT WORKING PAPERS IN LINGUISTICS

Volume 3

Theoretical issues
in
the Grammar of Semitic Languages

Edited by

Hagit Borer

and

Youssef Aoun

1981

STRESS, PRETONIC STRENGTHENING, AND SYLLABIFICATION
IN TIBERIAN HEBREW

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0. Introduction

Although most students of syllabification in metrical phonology have
confined their attention to accentual and distributional evidence, the role
of syllable structure in phonological processes is not necessarily limited
to these phenomena. Hebrew in particular has a number of rules that alter
the canonical shape of syllables in various regular ways, of which the most
interesting may be the complex of pretonic strengthening rules, rules that
create CVC and CVV syllables immediately before the main stress. I will
argue below that all such segmental phonological rules are governed by a
strong constraint on syllable structure preservation, yielding outputs in
conformity with particular phonotactic targets, as has been observed in the
now extensive literature on conspiracies.

This article, then, is intended as a contribution to the metrical
analysis of Tiberian Hebrew as well as to the theory of syllabic influence
on the application of phonological rules. Section 1 presents an overview of
the theory of Hebrew syllable structure in McCarthy (1979a), as well as
an interesting alternative developed by Hayes (1980). It also contains a
statement of the principle of syllable structure preservation. Section 2 de-
tails three rules of Hebrew phonology. The first, Main Stress Assignment, is of
interest not only for its essential role in conditioning the application
of the other two rules, but also for its resistance to conventional metri-
cal treatments without the invocation of ad hoc devices. The elucidation
of the rules of Pretonic Lengthening and Pretonic Gemination follows, with
a demonstration that, in spite of their evident functional similarity, they
must remain formally distinct in a descriptively adequate grammar.

No attempt is made here to produce an exhaustive description of Hebrew
phonology; such a goal is prohibited by both limitations of space and the

complexity of the phenomena under study. A fortiori, little motivation
is provided for most underlying forms or for the application of other,
irrelevant phonological processes. The interested reader may refer to
Prince (1975) and McCarthy (1979a) for more extensive justification of both.

1. Hebrew Syllabification

Under the theory of the representation of syllable structure developed
in McCarthy (1979a, 1979b), based on work by Kiparsky (1978, 1979), we can
express the basic syllable structures of Hebrew as in (1):

(1)　　a.　　　　　　　　　b.　　　　　　　　　c.
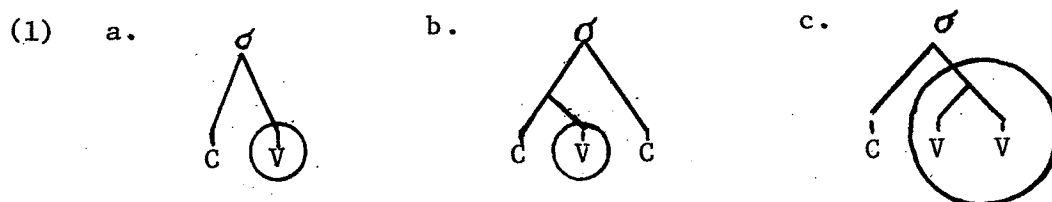
Hebrew accentual processes described in McCarthy (1979a) -- rules of secondary
stress assignment and stress shift -- mention syllable weight by means of the
branching character of the node circled in (1), referred to as the rhyme.
We can isolate this subconstituent of the syllable by the universal definition
in (2):[1]

(2)　　Rhyme $=_{\text{defn}}$　Maximal (i.e., least embedded) right
　　　　　　　　　　　branch dominated by σ that itself dominates
　　　　　　　　　　　vocalic material.

The evident peculiarity of Hebrew is that CVV syllables have a different
structure from CVC syllables, with the result that only the former have
branching rhymes. It is this property of CVV syllables that causes them alone
to be interpreted as heavy. The more usual syllable weight distribution is
achieved by assigning both CVC and CVV syllables the structure (1c), as in
the analysis of Arabic in McCarthy (1979a, 1979b).

Hebrew has two more syllable types, CVVC and CVCC. In underlying
representation neither can occur except word-finally, and only the former
can appear word-internally in derived representations. A characterization
of the structure of these syllables which accounts for their limited under-
lying distribution and some special accentual properties can be found in

McCarthy (1979a); they will not figure in the following discussion and are independent of the issues treated here.

There is, however, another possible account of Hebrew syllable weight, given the basic outlines of this analysis. It has been proposed (Selkirk forthcoming; Pesetsky 1979; Safir 1979; Hayes 1980) that syllables contain labeled internal constituents, formally similar to syntactic categories. Rather than defining the rhyme in terms of some geometric properties of the syllabic tree, as in (2), we would label some node of the tree as the rhyme. One possible inventory of syllable types is as follows:
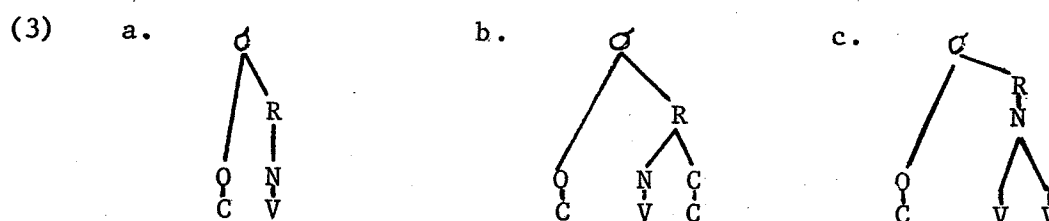
These representations will hold for Hebrew as well as languages like Arabic with more conventional syllable-weight distributions.

Apparent interlinguistic variation in the weight assigned to syllables of the same type is explained, not by different structures as in (1), but rather by different units on which the weight relation is defined. Thus, the usual syllable weight distribution will be characterized by the geometry of the rhyme, with branching (therefore heavy) rhymes in (3b) and (3c). But the special syllable weight of Hebrew will depend on the branching character of the nucleus, rendering only (3c) heavy. Rules of Hebrew that exploit the heavy/light distinction, like the accentual processes of McCarthy (1979a), will refer directly to the nuclei of syllables rather than their rhymes.

I will assume the correctness of the representations in (1) in the following discussion, but some caution is in order here. Although nothing I will say hinges on the choice between the two models, since this analysis requires only that syllables be provided with some sort of metrical structure allowing one terminal node per segment, nevertheless there are important empirical differences between them. It has recently been argued on the basis of three rules -- two processes affecting reduced vowels cited by Hayes (1980) and

Rappaport (this volume) and a rule simplifying geminate low glides with concomitant compensatory lengthening of the preceding vowel cited by Rappaport and Prince (1975) -- that the richer categorial model in (3) is necessary. The evidence is not yet entirely conclusive due to remaining problems in the representation of reduced vowels and the exceptionality of compensatory lengthening, but it appears that, given our current knowledge, the categorial model is superior. I will attempt a final resolution of this question in a forthcoming study.

Most metrical studies of syllabification have quite naturally focused on the role of representations like (1) in stress assignment. There are, however, further consequences of syllable structure for distributional constraints and for the application of phonological rules. Following many other students of this topic, I will assume that any string of segments which cannot be properly syllabified by the canons of some language is not a possible word of that language, unless further explicit stipulations are made. Thus, a sequence ...VCCCV... is not a possible word of Hebrew unless, as is not the case, the grammar were to contain some additional rule providing for deletion or syllabification (by epenthesis, say) of the medial consonant.

This filtering effect of rules of syllabification on underlying representations is related to a somewhat broader generalization. It has often been noted that one result of the extensive literature on phonological conspiracies is the observation that the conspiratorial rules conform to some set of output canonical patterns which are identical to those of underlying representations. In McCarthy (1976, 1979a) it is claimed that this reflects a general requirement that phonological rules be structure-preserving; that is, a phonological rule may apply to a form only if its output can be properly syllabified. If the output cannot be syllabified, the rule is blocked from applying, but the derivation may continue with the next rule.[2]

This principle of syllable-structure preservation will clearly permit fairly rich interaction between rules of syllabification and segmental phonological rules. Two qualifications are in order, however. First, this principle is intended to apply only to phonological rules in the strict sense,

and not to phonetic ones. I presume, then, that the numerous vowel reductions in rapid speech in English are not governed by this constraint.

Second, as in the case of the filtering of underlying representations, deviations from this principle are allowed by explicit stipulation. So, for example, a Hebrew rule of schwa deletion creates word-internal CVVC syllables, which do not occur underlyingly. This requires special stipulation, although the fact that the same rule does not create internal CVCC syllables can be deduced from the theory.[3]

2. A Fragment of Hebrew Phonology

2.1 Main Stress Assignment

A persistent problem for metrical analyses of Hebrew has been the formulation of the rule assigning main stress. This rule applies quite early, perhaps at the beginning of the derivation. The location of main stress is subsequently changed in many cases by the rule of vowel reduction described in Section 2.3 and by accent shift rules mentioned above and discussed extensively in McCarthy (1979a).

The basic data are those in (4) (here and subsequently I give the actual surface forms resulting from later rules in parentheses):

(4) a. katáb (kātáb) 'he wrote'
         yaqúum (yāqúm) 'he arises'
     b. katábta (kātábtā) 'you (m. sg.) wrote'
         katábtii (kātábtî) 'I wrote'
         katabúu (kātbû) 'they wrote'

The apparent generalization -- one which is quite simple to state in purely segmental terms -- is that stress falls on the ultima in consonant-final words and on the penult in words ending in a vowel, whether long or short.

Clearly, we could construct fairly elaborate analyses of Hebrew syllable weight which would allow the structure, and consequently the weight, of some syllable types to vary contextually. Under such a proposal, CVC syllables would be heavy and CV and CVV syllables light if and only if word-final.

This would then cause CVC syllables to attract stress only when word-final. Alternatively, we could complicate the formulation of the main stress rule to allow it to have access to some syllable weight characteristics different from those referred to in other rules of accentuation. These alternatives are pursued, with marginal success, in McCarthy (1979a) and Hayes (1980).

There is, however, a third possibility suggested by other work by Hayes (1980). Hayes argues that a wide variety of generalizations about stress placement in English can be captured by designating certain word-final syllables as extrametrical under morphological and phonological conditions. The extrametrical syllables are ignored in the construction of metrical trees by stress assignment rules, and only later are conventionally incorporated as weak sisters into the usual left-branching structure of the English foot.

The application of the notion of extrametricality in Hebrew main stress is quite straightforward. First, all vowel-final syllables are marked as extrametrical at the end of a word by rule (5):[4]

(5) Final Extrametricality

$$[XV]_\sigma \longrightarrow \text{Extrametrical} / \underline{\quad} \#\#$$

There is no reason, based either on the formalism or Hayes's analyses, to believe that rules assigning extrametricality refer to syllable weight, and in this respect they differ from rules assigning metrical structure for stress.
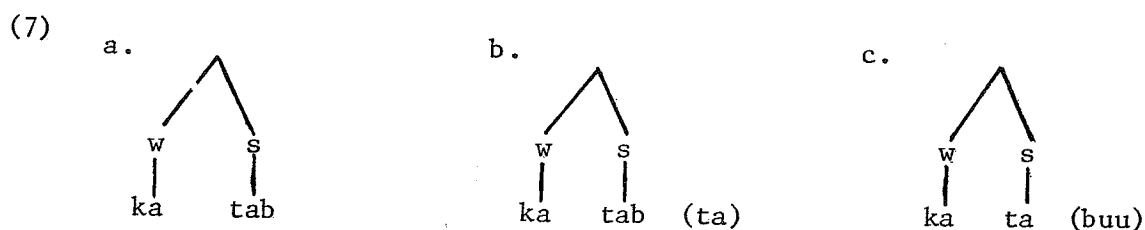
Minus the extrametrical syllables, Tiberian Hebrew simply exhibits the familiar pattern of final stress, which we can express by rule (6):

(6) Main Stress Assignment
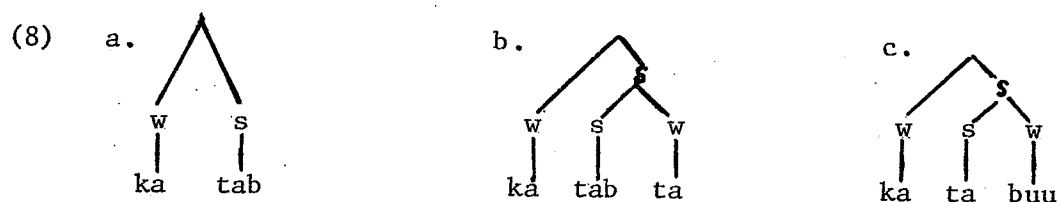
    a. Form a right-branching unbounded tree.

    b. Label all right nodes strong.

Application of these rules to some of the forms in (4) yields the representations in (7), where, following Hayes, extrametrical syllables are parenthesized:

(7) a.

```
      /\
     w   s
     |   |
     ka  tab
```

b.

```
      /\
     w   s
     |   |
     ka  tab  (ta)
```

c.

```
      /\
     w   s
     |   |
     ka  ta  (buu)
```

Since the syllables which are marked as extrametrical in (7) do participate in the overall metrical structure of the word, we must provide for adjoining them to the metrical tree. Following Hayes, we will label them as weak nodes. Furthermore, this adjunction is assumed to respect the overall right-branching geometry generated by (6). Thus, the final result of Main Stress Assignment is (8):

(8) a.

```
      /\
     w   s
     |   |
     ka  tab
```

b.

```
       /\
      /  s
     w  /\
     |  s  w
     |  |  |
     ka tab ta
```

c.

```
       /\
      /  s
     w  /\
     |  s  w
     |  |  |
     ka ta buu
```

There is a certain amount of independent evidence which supports this analysis. Some exceptions to the usual distribution of main stress are given in (9):

(9) a. malkíi (malkî) 'my kind'

          dabaríi (dəbârî) 'my word'

          suusíi (sûsî) 'my horse'

    b. ʔahebátek (ʔahēbátek) 'she loved you (f. sg.)' Ru 4, 15

          sarapátam (sərāpátam) 'it (f.) burned them (m.)' Is 47, 14

As is clear from (9), exceptions to the main stress rule take two forms: vowel-final words with ultima stress (9a) and consonant-final words with penult stress (9b). There are no cases of words with exceptional antepenult stress. Furthermore, what is not entirely apparent from (9) is that these exceptions and others like them are under strict morphological government. The type in (9a) can be identified by the pronominal suffix -î 'my'. (9b) is composed exclusively of forms with the inflectional desinence -at

'3rd f. sg. perfective' and a pronominal object suffix.

These observations can be readily understood in a system that incorporates the rule of Final Extrametricality (5). We will say that the suffix -î is a negative exception to Final Extrametricality, whereas the conjunction of verbal suffixes in (9b) induces Final Extrametricality as a positive exception, despite the word-final CVC syllable. The absence of words with exceptional antepenultimate stress follows from the formulation of (5): it marks only the final syllable as extrametrical, and thus it would require either an additional stipulation in the labeling rule or (what is in any case prohibited by Hayes's limitation of extrametricality to segments or syllables adjacent to juncture) an additional rule also marking penultimate syllables as extrametrical. Thus, the occurring pattern of exceptionality is governed by apparent violations of the single rule (5). Moreover, the usual morphological regularity in exceptions to main stress is consonant with another property of Hayes's theory, particularly evident in his analysis of English. Morphological government of extrametricality rules pervades the English stress system, strongly recommending the extension of this notion to Hebrew.[5]

Since the rule of Main Stress Assignment obviously precedes Pretonic Lengthening and Pretonic Gemination, to be discussed below, I will assume that forms are already provided with representations like those in (7). I will further assume, as is demonstrated in McCarthy (1979a), that rules of secondary stress assignment, stress shift, and vowel reduction have not yet applied to alter this metrical structure. Therefore, unique reference to the location of main stress can be made simply by designating that syllable which is immediately dominated by the metrical label s.

2.2 Pretonic Lengthening

The first major segmental phonological rule, a rule of no little theoretical interest, lengthens vowels in open syllables that immediately precede the syllable bearing the main stress:

(10)   a.   katábuu → kaatábuu (kātbû) 'they wrote'
       yišlaḥéka → yišlaaḥéka (yišlāḥakā) 'he sends you (m. sg.)'
       9oolamíim → 9oolaamíim (9ōlāmîm) 'eternities'

(continued)

b. lebáb → leebáb (lēbáb)   'heart'

zɑqeniím → zaqeeniím (zɔqēnîm) 'old (m. pl.)'

c. katabtém (kətabtém)   'you (m. pl.) wrote'

maptéḥ (maptēaḥ)   'key'

d. ?esuuriím (?ăsûrîm)   'chains' Qoh 7, 26

zaqentém (zɔqantém)   'you (m. pl.) got old'

The forms in (10a) and (10b) show the lengthening of a and e in open pretonic syllables, while those in (10c) and (10d) show the failure of these vowels to lengthen in syllables which are closed or do not immediately precede the main stress.

The remaining short vowel o behaves rather differently than a and e. It appears that this vowel must be systematically excluded from the purview of this process. In Blake's (1951) valuable survey of pretonic lengthening only one valid case in which o seems to undergo this rule was discovered. About 300 verb forms are attested with the archaic imperfective suffixes -uun '2nd, 3rd m. pl.' and -iin '2nd f. sg.'. These suffixes are regularly stressed, and o in the preceding syllable usually lengthens: yilqōṭûn 'they collect' Ps 104, 28. But Prince (1975) points out that these forms are almost certainly the result of hypercorrection in response to the use of archaic morphology and the typical appearance of these forms in pausal (phrase-final) position, where a long ō is regularly expected by the application of other rules. Moreover, there are numerous unexplained exceptions to this pattern. In view of these observations, particularly the limited morphological context, I will completely rule out the possibility of pretonic lengthening of o.

There are several interesting patterns of lexical exceptionality to pretonic lengthening that must also be dealt with in a fully adequate analysis. First, there are numerous cases where e unexpectedly fails to lengthen, although all other conditions are met: ?ooyebiím (?ōybîm) 'enemies'; yagaddeléka (yɔgaddelkā) 'he magnifies you (m. sg.)'.

In Prince (1975) and McCarthy (1979a) it is claimed that the factor determining whether e lengthens in pretonic open syllables is the weight of the preceding syllable. As in (10b), e lengthens if preceded by a

word-boundary or a CV syllable, but it does not lengthen if a CVV or CVC syllable precedes. Close examination of the data, however, does not support this interpretation of the contrast between lengthened and unlengthened e. First, the exclusion of preceding CVV or CVC syllables is too strong to account for the occurrence of pretonic lengthening of e in (11):

(11) a. yooledát→yooleedát (yōléda)   'woman in labor'
          boogedát→boogeedát (bōgéda)   'treacherous woman'
          too9ebát→too9eebát (tō9ēba)   'abomination'

      b. maggepát→maggeepát (maggēpa) 'overthrow'
          makšelát→makšeelát (makšēla) 'ruin'
          massebát→masseebát (massēba) 'pillar'

In (11a), despite a preceding CVV syllable, we find pretonic lengthening of e, and similarly in (11b) in spite of the preceding CVC syllable. There are morphological subregularities that are of some predictive value in distinguishing between lengthening and nonlengthening types. For example, feminine nouns of the pattern CooCeCat usually lengthen e pretonically, but the formally identical participles ordinarily do not. There are, however, more than a few exceptions to this.

Second, the exclusion of preceding CVC and CVV syllables is too weak to account for occasional failures of e to lengthen pretonically in forms like those of (12):

(12) a. šemii (šəmî)   'my name'
          benii (bənî)   'my son'
          benek (bənék) 'your (f. sg.) son'
          kelii (kəlî)   'vessel'
      b. bediil (bədîl) 'lead'
          gebuul (gəbûl) 'boundary'
          lebuuš (ləbûš) 'garment'

The forms in (12a) represent a small class of nouns with this special property. (12b) is a much larger class, although the underlying represen-

tations are not easily motivated. These nouns will, for other reasons, never appear without schwa in the first syllable on the surface, so no alternations support (12b). But we can induce underlying e in the initial syllable of at least some nouns of this sort from considerations of possible nominal vowel patterns and from the regular pretonic lengthening of e in forms with initial ? like ?ebús 'crib' or ?ezób 'hyssop'.[6]

The existence of both positive and negative exceptions to the claim that e does not lengthen pretonically after CVC and CVV syllables strongly argues against incorporation of this context into the formulation of a pretonic lengthening rule. This is all the more compelling in view of the fact that the exceptions, to some extent, reflect well-defined morphological or lexical classes. I will, then claim that pretonic lengthening does not refer to the weight of the preceding syllable at all, but that the nonlow front vowel e is occasionally an idiosyncratic exception to it. This exceptionality is sometimes purely lexical and sometimes assigned by morphologically-governed redundancy rules of some generality. We will see cases where a also fails to lengthen pretonically in section 2.3.

Another sort of exceptionality involves forms where the vowels a and e lengthen in syllables which do not immediately precede the main stress. In certain morphologically-defined subclasses, particularly feminine nouns in e, this overapplication of pretonic lengthening appears to be the rule. This phenomenon is exemplified in (13):

(13) a. śamehee → śameehee (śəmēhê) 'joyful of' Ps 35, 36

     b. me9eehém → mee9eehém (mē9éhém) 'their bowels' Ez 7, 19

     c. 9aremat → 9areemat (9ărēmat) 'heaps of' Hag 2, 16

     d. sariisiim → saariisiim (sārîsîm) 'officers' 2 Kgs 20, 18

     e. pariisiim → paariisiim (pārîsîm) 'violent (m. pl)' Jer 7, 11

     f. šabuu9oot → šaabuu9oot (šābû9ôt) 'weeks' Ex 34, 22

The importance of this kind of overapplication lies not in the variation that it engenders, but rather in its highly constrained nature. Only a and e lengthen in this way, whereas o, which is excluded from pretonic lengthening,

is excluded also from this extension of that process.[7]

With this philological detail aside, we can now proceed to the formulation of the rule of pretonic lengthening. Under the theory of syllabic influence on segmental phonological processes developed in section 1, certain aspects of this rule which, at first glance, appear to be essential to its correct application need not be stipulated. First, we do not have to confine pretonic lengthening to open syllables, since, if it were to apply it in a closed syllable, it would yield an output of the type CVVC which is prohibited word-internally. Second, the impossibility of lengthening vowels which are already long follows from the canons of Hebrew syllabification because VVV or VVVV sequences cannot be syllabified (cf. Hayes (1980)). Third, we do not need to specify the metrical structure of the derived CVV syllable, since it will be reformed as (1c), also by virtue of the principle of syllable-structure preservation.

Thus, we may formulate pretonic lengthening as in (14):

(14) Pretonic Lengthening

$$\emptyset \rightarrow V \;/\; [X \quad \begin{bmatrix} V \\ -rnd \\ \langle +low\rangle_a \end{bmatrix} \quad \underline{\hspace{2cm}} \quad Y]_\sigma \quad \overset{\langle s\rangle_b}{\underset{\sigma}{\overset{|}{[Z]}}}$$
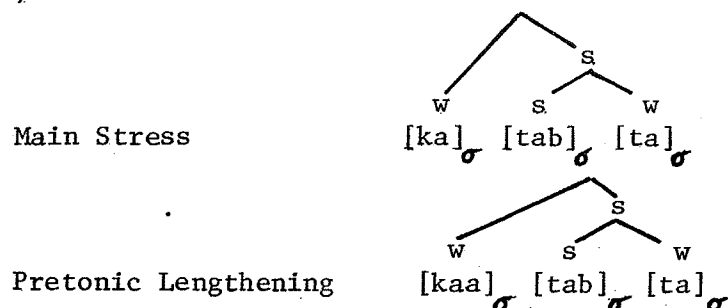
Condition: a, ⌣b under various morphological and lexical conditions.

The metrical label s on the contextual syllable locates the main stress, and the feature [-round] excludes o from the influence of this rule. The material in angled brackets reflects the various sorts of lexical exceptionality described above.

The formulation of the structural change of this rule leaves a certain ambiguity as to the quality of the derived long vowel. The theory of morphological and phonological representations developed in McCarthy (1981a, 1981b) provides the correct result automatically, so the long vowel is identical in quality to its short progenitor. A full elucidation of this mechanism here, however, would take us too far afield.

The derivation in (15) illustrates the application of Pretonic Lengthening to the form kàtabtā, whose main stress structure appears in (8b):

(15)

Main Stress

$$
\begin{array}{ccc}
 & \overset{\displaystyle s}{\diagup\diagdown} & \\
w & s & w \\
[\text{ka}]_\sigma & [\text{tab}]_\sigma & [\text{ta}]_\sigma
\end{array}
$$

Pretonic Lengthening

$$
\begin{array}{ccc}
 & \overset{\displaystyle s}{\diagup\diagdown} & \\
w & s & w \\
[\text{kaa}]_\sigma & [\text{tab}]_\sigma & [\text{ta}]_\sigma
\end{array}
$$

The derived syllable kaa is restructured into a tree of type (1c).

2.3 Pretonic Gemination

Although a rule of Pretonic Lengthening may seem a bit unusual, Hebrew has the additional embarrassment of Pretonic Gemination. Together these rules form the cluster of processes referred to in the title of this article.

Since the argument of this section is rather elaborate, I will summarize it briefly here. A rule is motivated and formulated which geminates the consonant immediately following a pretonic CV syllable. The obvious functional unity of this rule and Pretonic Lengthening, both of which create apparently heavy CVV and CVC syllables pretonically, is shown to be not supported by formal considerations of domain of application, and it is therefore argued that the two rules should not be collapsed. The domain of Pretonic Lengthening is limited to the phonological word, whereas Pretonic Gemination applies in a particular class of sandhi contexts as well.

By virtue of the principle of syllable-structure preservation, Pretonic Gemination may not create CVVC syllables or triconsonantal clusters. It is therefore confined to applying after pretonic CV syllables, so it is often bled by the preceding rule of Pretonic Lengthening.

But pretonic o, which is not subject to Pretonic Lengthening, does engender gemination of the following consonant. This phenomenon occurs regularly in nouns and adjectives, as (16) demonstrates:[8]

(16) a. kotónt → kottónt (kuttŏnet) 'garment' Gen 37, 31

b. ꝰagolóot → ꝰagollóot (ꝰăgullót) 'round (f. pl.)' 1 Kg 7, 31

c. ꝰeeromíim → ꝰeerommíim (ꝰêrummîm) 'naked (m. pl.)' Gen 3, 7

d. ꝰamoqóot → ꝰamoqqóot (ꝰămuqqót) 'deep things' Job 12, 22

e. ꝰamoqá → ꝰamoqqá (ꝰămuqqá) 'deep (f. sg.)' Ez 23, 32

Underlying long ō does not permit gemination of the following consonant as expected: šaloomiim (šŏlômîm) 'peace (pl.)' maqoomoót (mə̆qômót) 'places'.

There are, however, also many cases of nouns and adjectives where a induces gemination of the following consonant, rather than itself undergoing Pretonic Lengthening:

(17) a. ꝰagamíim → ꝰagammíim (ꝰăgammîm) 'marshes' Ex 8, 1

b. qaṭaníim → qaṭanníim (qə̆ṭannîm) 'small (m. pl.)' Is 36, 9

qaṭanoot → qaṭannóot (qə̆ṭannót) 'id. (f. pl.)' Ez 16, 61

c. ꝰadamdamóot → ꝰadamdammóot (ꝰădamdammót) 'reddish (f. pl.)' Ez 16, 61

d. ꝰasiir → ꝰassíir (ꝰassîr) 'captive' Is 10, 4

Though long ā is very rare in underlying representations in Tiberian Hebrew, nevertheless, like long ō, it demonstrably never triggers gemination. Therefore we can say, as a first approximation, that the items in (17) are lexical exceptions to Pretonic lengthening, so they are subject to a following rule that geminates a consonant after pretonic short a. Since o is excluded in the formulation of Pretonic Lengthening, all underlying short pretonic o's, at least in nouns and adjectives, will trigger this putative gemination rule. On the other hand, e virtually never conditions pretonic gemination within a word. This vowel either lengthens pretonically or, failing that, remains unchanged and is subsequently reduced.

As is the case with Pretonic Lengthening, pretonic gemination has a number of lexically or morphologically governed exceptions. Although the noun types in (16) and (17) demonstrably do not have underlying geminates,[9] many nevertheless display gemination even when the following syllable is stressless, a situation similar to the one that we saw with Pretonic
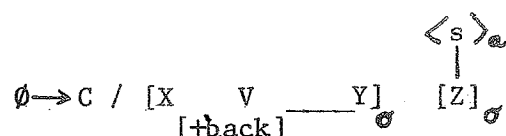
Lengthening in (13):

(18) a. kottontíi (kuttontî) 'my garment' Job 30, 18

  b. ma9rommeehém (ma9árummêhém) 'their nakedness (pl.)' 2Ch 28, 15

  c. ˙paqoddat (pәquddat) 'numbering of' 1Ch 23, 11

    paqoddaatám (pәquddátám) 'their stores' Is 15, 7

  d. ?abbiiriím (?abbîrím) 'valiant (m. pl.)' Ps 50, 13

Since this pattern of gemination even in nonpretonic syllables is fairly prevalent, Prince (1975) has taken it as evidence for a rule of gemination which does not refer to stress at all, applying sporadically under strict lexical government. This analysis fails to account for the fact that Pretonic Lengthening is subject to the same sort of overapplication, and that in this case the same sort of historical explanation can be sought as is described in note 7. Furthermore, a significant minority of the nouns undergoing pretonic gemination do give it up when the following syllable is stressless, as we would predict:

(19) a. kotont (kәtōnet) 'garment of' Gen 37, 33

    kotonóot (kotnṓt) 'garments' Neh 7, 69 & 71

  b. ?abiir (?ăbîr) 'valiant of' Gen 49, 24

  c. ?agamee (?agmê) 'marshes of' Is 14, 23

    ?agameehém (?agmêhém) 'their marshes' Ex 7, 19

  d. nikbadeehém (nikbәdêhém) 'their wealth' Ps 149, 8

  e. 9aweriím (9iwrîm) 'blind (m. pl.)' Is 29, 18

    We can now turn to the problem of formulating the rule of Pretonic Gemination. As in the case of Pretonic Lengthening, much of the apparent context of this process can be deduced from the principle of syllable structure preservation. It need not be stipulated that gemination fails to apply after long vowels or closed syllables and that the derived structure assumes the form (1b). Thus, the rule can be written as in (20):

(20) Pretonic Gemination

$$\emptyset \rightarrow C \ / \ \begin{bmatrix} X & V \\ & [+back] \end{bmatrix} \underline{\quad} Y]_\sigma \quad \begin{matrix} \langle s \rangle_a \\ | \\ [Z] \end{matrix}_\sigma$$

Condition: ᴧ a under various morphological and lexical conditions.

As in Pretonic Lengthening, the angled brackets and condition characterize the case of overapplication of the rule in nonpretonic syllables. The feature [+back] excludes the application of Pretonic Gemination after the vowel e.

We can now address the question of the simultaneous presence in Hebrew of rules of Pretonic Lengthening and Pretonic Gemination. Here we have two rules which apparently share the function of strengthening the syllable immediately preceding the stress. It is difficult to see how these two processes would be conflated, and in fact consideration of the syntactic domains of application of these two rules shows that they are incompatible.

Our concern will be with the phenomenon of junctural consonant gemination, which has never been suitably integrated into any treatment of Hebrew phonology known to me. The traditional Orientalists' designation for this phenomenon is dageš forte conjunctivum -- dageš forte the symbol for gemination, conjunctivum because of its junctural nature. The relevant juncture for the application of this rule is the position between two phonological words that are sole sisters in the surface phrase-marker with some readjustments. This context functions as well in the rhythm rule and spirantization rule of Hebrew, discussed in McCarthy (1979a).

Apart from this syntactic condition on junctural gemination, a variety of phonological factors have been observed. I will state each of these conditions on the surface level, following the description in Baer (1880), and then will proceed to a more abstract analysis.

The first condition is a requirement that the final vowel of the word preceding the geminated consonant be a or e. (Here and subsequently I give accentuations obtaining before the application of the Hebrew Rhythm Rule in parentheses. The significance of this information will emerge shortly.)

(21)   a.   šābîtā   ššebî
           you-led-captive   captivity

           'you have led captivity captive'   Ps 68, 19

           lō-higgádtā   llî
           not-you-showed   to-me

           'you did not show me'   Gen 12, 18

   b.   yē9áśe   llô   (yē9āśé)
           it-is-done   to-him

           'it will be done to him'   Ex 21, 31

           9óśe   ppərî   (9óśe)
           bearing   fruit

           'producing fruit'   Gen 1, 11

   versus no gemination in

   c.   9āśîtî   kēn
           I-did   thus

           'thus I acted'   Neh 5, 15

           šîrû   lānû   (šîrû)
           sing   to-us

           'sing (m. pl.) to us'   Ps 137, 3

This rather peculiar condition can be substantially simplified. I have already alluded to the fact that long $\bar{a}$ essentially does not occur in underlying representations in Hebrew, so all instances of surface $\bar{a}$ are derived from short a (which in some cases derives from underlying at). The surface $\bar{a}$ results from Final Lengthening, which we will formulate shortly. Furthermore, the skewing of the lexicon by redundancy rules is such that a and e are the only underlying word-final short vowels. By transitivity of reasoning, then, the requirement that the geminated consonant follow surface a or e is equivalent to demanding that it follow any underlying short vowel. We can achieve this somewhat more general expression of junctural gemination merely by ordering gemination relatively early in the derivation.

The condition that the preceding vowel is short is, of course, reminiscent of the results of syllable-structure preservation, since gemination after a long vowel would yield a prohibited CVVC syllable. Formal appeal to this principle, however, first requires that the domain of syllabification in Hebrew be larger than the phonological word -- minimally, it should be the

Hebrew sandhi domain of sole sisters in the syntactic phrase marker. This means, then, that well-formed syllables may be created which cross the juncture between words. This is not surprising in view of the similar properties of Classical Arabic, where the phonological phrase is demonstrably the domain of syllabification.

Under these assumptions, the immediate output of junctural gemination on two representations from (21) will be (22):

(22) a. (=21a)

[šaa]$_\sigma$ [bíi]$_\sigma$ [taš]$_\sigma$ [šé]$_\sigma$ [bii]$_\sigma$

b. (=21c)

[9aa]$_\sigma$ [šíi]$_\sigma$ [tii]$_\sigma$ [keén]$_\sigma$

Note that the third syllable in (22a) contains material from two words, since syllabification is not blocked by juncture. The initial consonant of the final syllable in (22b) is not geminated because that would lead to a syllable [tiik]$_\sigma$ of the prohibited type CVVC.[10]

Notice, however, that the ultimate surface reflex of the syllable [taš]$_\sigma$ in (22a) is [taaš]$_\sigma$, a forbidden CVVC syllable. This vowel lengthening is a consequence of a later rule applying to word-final vowels, which invariably transforms final a to ā regardless of its syntactic or syllabic context. This rule, then, must explicitly violate the principle of syllable-structure preservation, even though junctural gemination cannot. There are various possibilities for indicating this stipulation formally -- as I have no particular proposal to make, I merely indicate it verbally:

(23) Final Lengthening

$$\emptyset \rightarrow V \;/\; \begin{matrix} V \\ [+low] \end{matrix} \underline{\quad} \#\#$$

          Condition: May create [CVVC]$_\sigma$.

This rule will, of course, be ordered after junctural gemination.

The second condition on junctural gemination is the requirement that the syllable immediately following the geminate have main stress, as in (21).[11]

A stressless or secondary-stressed syllable will not suffice, as the lack of junctural gemination in (24) illustrates:

(24)   a. bārāktā   bārek
             you-knelt kneeling

            'you knelt down' Num 23, 11

      b. hēmmā   yîršû-ʔāreṣ
            they   will-inherit-earth

            'they will inherit the earth' Ps 37, 9

      c. məbārăkēkā   bārûk
            your-blessers blessed

            '(make) your (m. sg.) blessers blessed' Num 24, 9

In sum, then, we must restrict junctural gemination to the position immediately preceding main stress, a property which exactly mimics Pretonic Gemination. In view of the fact that considerations of syllable-structure preservation also have identical effect in pretonic and junctural gemination, we must suspect that these constitute a single gemination process. What apparently militates against this somewhat, however, is a final baroque set of conditions limiting junctural gemination after ā but not ē. The word preceding the geminated consonant can have penult stress, as in (21): it may also have ultima stress before the application of the Hebrew Rhythm Rule, but in that case its penult must be a CVVC syllable (25a) or a syllable containing a reduced vowel (25b):

(25) a. māṣʔā   bbáyit (māṣʔá)
           she-found house

           '(the swallow) found a nest' Ps 84, 4
          mālʔā   ššóhar (mālʔá)
          was-filled present

           '(their right hand) was filled with a gift' Ps 26, 10

      b. nittənā   llô
           she-was-given to-him

           'she was given to him' 2Kg 25, 30
          nismənā   bbāk
          let-us-rejoice in-you

           'let us rejoice in you (m. sg.)' Song 1, 4

versus with CVV penult

c. mḗ?ā́ késep (mḕ?ā́)
   hundred silver

'a hundred pieces of silver.' Dt 22, 19

The formulation of the Rhythm Rule is developed in some detail in McCarthy (1979a). As this rule is ordered rather late in the derivation, we can freely abstract away from it in the discussion of a relatively early rule like junctural gemination.

Forms like mas̄?ā́ or mal̄?ā́ in (25a) with CVVC penults and final stress have just one possible source in an analysis of Hebrew of the sort developed here. They devolve from underlying forms /masa?a/ and /male?a/ by a reasonably complex derivation. Main stress is first assigned on the penult, and the antepenult syllable is lengthened by Pretonic Lengthening: maas̄á?a, maalé?a. The open penult syllable then reduces to schwa with concomitant shift of stress to the ultima, a process which is elucidated metrically in Prince (1975) and McCarthy (1979a): maasə?á, maalə?á. Elision of schwa, which is permiteed to create CVVC syllables, and Final Lengthening yield the observed surface forms.

Similar derivations hold for nittəná and nismə̄ḥá in (25b), which come from underlying /nittena/ and /nismaḥa/. The only difference is that in this case the reduced vowel is prevented from deleting by the preceding consonant cluster. (See also the discussion in note 3.)

The essential point of these derivations is that there exist representations of these forms with penult stress, before the application of Vowel Reduction. Therefore, at this early stage of the derivation, all words ending in a which immediately precede a juncturally-geminated consonant have penult stress. Since stress in Hebrew can fall only on the penult or ultima, this is equivalent to saying that the syllable before the geminated consonant must be unstressed if it contains the vowel a.

It turns out that there is a fairly natural way to collapse the two rules of Pretonic Gemination, the one within words and the other in sandhi. Clearly both processes share the structural change of geminating a consonant, and both apply in the context immediately before the main stress. There are,

however, some apparent differences between these rules. First, Pretonic
Gemination as formulated in (20) does not explicitly require that the pre-
tonic syllable itself be unstressed, yet we saw in (25) that such a condi-
tion must be placed on junctural gemination when the pretonic vowel is a.
But the syllable immediately preceding the main stress within a word
will never bear the stress, since each word has only one main stress, so
we can freely demand that Pretonic Gemination conform with the requirement.
Second, Pretonic Gemination in (20) is inapplicable when the vowel of the
pretonic syllable is [-back], but junctural gemination is observed with
both of the final underlying short vowels a and e. Since it appears that
essentially all cases of junctural gemination after e are ones in which e
is contained in a stressed syllable before application of the Rhythm Rule,
as in (21b), [12] and since no vowel ever falls in a stressed syllable imme-
diately before a stress in the same word, we can limit gemination after e
just to those cases where e is stressed. This is the equivalent of a rule
of gemination after e that applies only in juncture. Finally, the lack of
junctural gemination after the other short vowel o can be attributed simply
to the absence of word-final short o in underlying representations.

   In sum, we can formulate a single, conflated gemination rule as in (26):

(26)   Gemination

$$\emptyset \rightarrow C \ / \ [X \begin{bmatrix} \overset{\langle s \rangle_b}{\overset{|}{V}} \\ \langle -back \rangle_b \end{bmatrix} \underline{} \ Y]_\sigma \ [Z]_\sigma^{\overset{\langle s \rangle_a}{\overset{|}{}}}$$

Condition: $\smallsmile$a under various morphological and lexical conditions.

The pair of angled brackets labeled b characterize the case of gemination
after the nonback vowel e: gemination can occur if and only if that vowel
is stressed. Thus, gemination after a will take place if and only if it is
unstressed. The other angled brackets and the condition recapitulate the
exceptionality of Pretonic Gemination expressed in (20). Such exceptionality
-- the extension of gemination to nonpretonic environments -- is found in
junctural contexts as well, usually appearing systematically after certain
words or in fixed expressions: ma-ggā́dlû 'how great they are' Ps 92, 6;
mōšɛ́ llēmŏ́r 'Moses (quote)' Ex 6, 10 et passim.

This result has several interesting theoretical consequences. First, it is clearly inconsistent with the various interpretive or natural theories of phonology that necessarily distinguish systematically between sandhi and word-internal rules. Second, in a larger sense it supports the fairly abstract analysis of Hebrew phonology pursued here, since we may assume that alternations in sandhi reflect generalizations that cannot be expressed lexically. Third, the point most germane to the issue of Hebrew syllabification is that (26) supports the distinction between Pretonic Lengthening and Gemination. In no case do we find Pretonic Lengthening applying in sandhi its upper bound is just the phonological word. This is not an empty claim. Although Final Lengthening will obscure the direct effect of putative application of Pretonic Lengthening to a word-final vowel, we would still see the result of Pretonic Lengthening bleeding Gemination in this position, since Gemination cannot apply after a long vowel. This is illustrated in the hypothetical derivation in (27):

(27) Underlying Representation   šabiita šeby (=21a)

      Main Stress   šabíita šéby

      Pretonic Lengthening   šaabíitaa šéby
      (applied juncturally)

      Gemination   DNA

      Final Lengthening   Applies Vacuously

      Other Rules   *šaabíitaa šébii (cf. (21a))

Pretonic lengthening of the syllable __ta__ in (27) under the influence of stress in the follwoing word prevents the subsequent application of Gemination, yielding an incorrect result. The only available way of excluding derviations like (27) is to limit the domain of Pretonic Lengthening to the phonological word, preventing it from applying in sandhi.[12]

What these lucubrations reveal, apart from a simple analysis of a complex phenomenon, is the fact that Pretonic Lengthening and the single rule Gemination have different domains of application, the phonological word in the former and the Hebrew sandhi context in the latter. We see, then, that the apparent functional unity of pretonic strengthening processes is rather less compelling than it seemed at first, since one sort of strengthening

may transcend juncture and one may not. The formal division into Lengthening and Gemination is also supported by these domain considerations, since no theory known to me would permit the conflation of processes with identical contexts but with different upper bounds of application. In sum, the Lengthening/Gemination schism receives strong confirmation from the subtleties of these sandhi phenomena.

Footnotes

　　*Portions of this work are drawn from McCarthy (1979a). The transcription system used here has the following special characteristics. Long vowels are written as $\hat{v}$ or $\bar{v}$, with circumflex indicating plene writing with yod or waw in the Masoretic text and macron otherwise. Superscript a denotes the furtive patach, a low off-glide inserted by a relatively late phonetic process. Spirant allophones of the stops b, d, g, p, t, and k and secondary stress are not marked to avoid cluttering the transcriptions unnecessarily.

[1] In the indication of the rhyme constituent in (1b) I follow Prince (1980). I should note that the definition (2) will require some modification to deal with CVVC and CVCC syllables as they are analyzed in McCarthy (1979a, 1979b).

[2] There is an important difference between the phonological and syntactic analogues of the structure preservation. Syntactic theories in which structure preservation plays a role have typically also provided that all transformational rules are optional. It follows from the usual conception of optionality that the derivation will continue if a transformation is blocked by considerations of structure preservation. But phonological rules are typically obligatory, particularly the morphophonemic processes to which structure preservation is intended to apply. Therefore, we must provide universally that phonological derivations continue even after the blocking of an obligatory rule by the principle of syllable structure preservation.

[3] Schwa deletion yields a CVVC penult in the partial derivation kaatəbuu → kaatbúu, but it is blocked from applying to a form like yiktəbúu since a CVCC syllable would result: *yiktbúu.

[4] Here and subsequently I follow Selkirk (1980, forthcoming) in notating syllables by labeled brackets in phonological rules.
　　The rules assigning main stress have a slightly more complicated syntactic environment than the ad hoc notation ## indicates. Main stress is assigned at the right juncture of any word which is not in construct -- that is, the left branch of a phrase of roughly the form $[N\ XP]_{NP}$. A full specification of the main stress rule would include this syntactic information.

[5] Further evidence in support of the rule of Final Extrameticality can be found in the distinction between feminine nouns and 3rd feminine singular perfective verbs. Briefly, words of both categories have the underlying feminine desinence -at although only the nouns show the expected ultima stress. We can, then, say that this suffix exceptionally undergoes Final Extrametricality in verb forms only.

[6] In some individual cases it cannot be demonstrated, except on historical grounds, that the vowel of the first syllable is not o rather than e,

but considerations of the overall pattern show that forms with underlying
initial e must exist.

[7]It is not difficult to see that there is an historical explanation for the
occasional overapplication of Pretonic Lengthening, as in (13). All the
forms displaying this phenomenon are ones in which the vowel is lengthened
elsewhere in the paradigm by a regular application of this rule. It is
evident, then, that paradigm leveling has had some effect, in at least
some nouns, on the application of Pretonic Lengthening.

[8]Verb forms present a somewhat different pattern. Verbs of the so-called
Qal passive, with underlying o in the first syllable and with stress in the
second syllable, regularly geminate the pretonic consonant: luqqáḥ 'it
was taken' Gen 3, 23. One Qal passive form is attested (Is 51, 1) which has
gemination before an unstressed syllable, but this is to be explained as
an instance of the paradigm leveling also evidenced in (18).

Verb forms with object pronoun clitics never show pretonic gemination
even when all known phonological conditions are met. Thus, we have from
/yiqtoléka/ the forms yiqtolkā and pausal yiqtəléka, but not *yiqtulləkā
or *yiqtulleka. The verbal clitic group, then, must be excluded formally
from the context of Gemination. Pretonic Lengthening, on the other hand,
does apply in verb+clitic environments; compare yidbāqkā and pausal yidbāqéka
from /yidbaqéka/. This difference in domain of application of Gemination
and Lengthening further supports the argument in the text for the formal
separation of these two processes.

[9]The forms in (16) and (17) systematically show tonic lengthening of the
vowel in the uninflected forms, contrary to the behavior of items with under-
lying final geminates.

[10]The CVVC syllable which would arise by application of junctural gemination
in (22b) is not strictly word final and is therefore not subject to the
special rubric permitting such syllables described briefly in section 1.

[11]The word pərî in (21b) does not have initial stress, and thus would
appear to be inconsistent with the generalization that the syllable imme-
diately following the geminated consonant must be stressed. The surface
stress in pərî, however, derives from a deeper initial stress /périi/
by a rule of vowel reduction with concomitant stress shift. This rule
demonstrably follows junctural gemination, as the forms in (25) and sub-
sequent discussion demonstrate.

[12]The sole case I have discovered in which unstressed e induces junctural
gemination of a following consonant arises with the demonstrative ʔélle
'these'. An example of such gemination can be found at Gen 33, 5. I
assume that this gemination is to be attributed to other causes, and this
assumption is supported by the consistent gemination after the corresponding
singular demonstrative zé 'this' regardless of any accentual considerations.

[13]Note that the expedient of ordering Gemination before Pretonic Lengthening
to avoid the derivation in (27) is not an available alternative. Word-

internal gemination after a occurs only in a quite circumscribed class of forms, analyzed here as exceptions to Pretonic Lengthening. Reordering the two rules would make the incorrect claim that Gemination is the rule rather than the exception word-internally after a.

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