On the Formal Definition of “Long Word” in Tiberian Hebrew: Diagnostic, Database, Generative Analysis, and Implications

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I would like to begin by acknowledging the unfailing encouragement and substantial collaboration of two gentlemen, Elan Dresher and Jim Price: a heartfelt thanks.

First, by way of background, my research programme, which I dub “Generative Masoretics,” is inspired by Dresher’s seminal paper in the journal Language (Dresher 1994). Dresher concludes that the best theoretical-linguistic analogue to the Tiberian system of accents is a prosodic representation: that is, the formal representation of the spoken language that organizes the prosodic units (syllables, feet, words, clitic groups) into a hierarchy of nested phonological phrases. Derivationally, this prosodic representation is the interface between semantics, syntax and morphology, on the one hand, and phonology and phonetics, and poetic metre and music, on the other.

Dresher’s analysis has great explanatory power. It explains why the accents function in part to directly demarcate the domains in which the Tiberian phonological rules operate. It explains the striking isomorphism between the syntax and accentuation, while in principle explaining the systematic deviation of the accents from the syntax. Finally, it naturally explains the compression and expansion phenomena of the accent systems in terms of the tempo and grain of the spoken language.

I myself would then add that the implied alternating highs and lows of this nonlinear prosodic representation naturally project an intonational contour, the music of the spoken language. These alternating highs and lows further imply a natural-language down-stepping series of tones which are undoubtedly the backbone of the liturgical declamation.

The goal of this Dresher-DeCaen extended programme is the formal specification of a direct and transparent computational-linguistic algorithm that takes as input the lexico-grammatical representations of arbitrary Hebrew strings, applies prosodic rules, constraints and principles, and correctly outputs the vowels and accents of the canonical Tiberian reading.

There are three components to this programme: (1) the rules, constraints and principles that can twist the syntactic trees into prosodic trees; (2) the rules, constraints and principles that govern grain and tempo; and (3) above all, a detailed formal description of the prosodic primitives—the terminal nodes of the prosodic tree.

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1 This text is the paper as read in Boston, with my handwritten corrections incorporated, and the examples in the SBL handout integrated into the text, but transcribed in the Westminster MORPH system to avoid problems with fonts on the internet.

I would like to take this opportunity to thank Aron Dotan and Harold Scanlin for accepting my paper for presentation at IOMS.
This is all by way of background. My starting point for today’s presentation is this: the fact that the Tiberian accentual systems (both prose and poetic) are sensitive to both “long” syllables (also called “superheavy” syllables) and to “long” words means that syllables cannot be the prosodic primitives of Tiberian Hebrew prosody, and words cannot be the organizing and timing units of these primitives.

Let me repeat: the very fact that Tiberian accentuation is sensitive to distinctions between long vs. short syllables and long vs. short words means we are fundamentally misunderstanding the principles of Tiberian Hebrew phonology.

I argue, rather, that the prosodic primitive is the sub-syllabic, weight-bearing mora of prosodic theory. Further, I argue that the syllable and word are largely irrelevant, and that the actual organizing and timing unit is the prosodic foot, as originally suggested by Khan (1987) and made more explicit by Dresher (1994).

Further, I will show that the relevant level of representation for Tiberian prosodic rules can be neither the underlying lexical representation nor the surface representation, but rather an intermediate abstract representation with implications for historical and comparative Semitics.

Let me begin with an accurate description of the Tiberian syllable, represented in (1), following Khan (1987), who in turn stands on the shoulders of Ben-David.

(1)

<table>
<thead>
<tr>
<th>short vowel</th>
<th>long vowel</th>
</tr>
</thead>
<tbody>
<tr>
<td>open</td>
<td>(a) [CV]</td>
</tr>
<tr>
<td>closed</td>
<td>(c) [CVC]</td>
</tr>
</tbody>
</table>

Vowel length, according to Khan’s description, is automatic in Tiberian Hebrew pronunciation (surface representation): the vowel is automatically long in an open syllable and/or a tonic syllable, short in a closed, unstressed syllable; failing this, the exceptional open syllable is marked with a shwa diacritic to signal a short vowel. Furthermore, Khan shows that the short vowel of the shwa syllable is the same length as the short vowel of the closed, unstressed syllable.

Syllable weight is also automatic, argues Khan. As a first approximation: all syllables count one, i.e., are metrical, except for the syllable bearing vocal shwa, which counts zero and so is extrametrical (Khan actually uses the term “phonological” for metrical).

This first approximation cannot be correct, as Khan subsequently explores, and for at least two reasons. First, some metrical syllables behave as if they were actually two metrical syllables: what we call “long” or more properly “superheavy” syllables. Second, the shwa syllable does apparently behave as a metrical syllable in certain environments.

I will examine two data-sets today, restricted in scope to the just the poetic accent system of Job, Psalms and Proverbs, which is much more sensitive to such distinctions—and systematically so.

The first data-set is clash data involving monosyllables.

To back up, Tiberian Hebrew phonology is characterized by a natural iambic rhythm (2a); where that rhythm fails, it is superimposed by nesiga or stress retraction.
(2b) to resolve clashing stressed syllables. This is explained linguistically as the imposion by rule of a metrical or prosodic foot: in this case, a rising or iambic foot.

\[
\begin{array}{c}
\text{KY L) SGR DLTY B+NY} \\
\text{Job 3:10a}
\end{array}
\]

\[
\begin{array}{c}
\text{Y)BD YWM )WLD BW} \\
\text{Job 3:3a}
\end{array}
\]

In the case of back-to-back monosyllables, the offending clash of stressed syllables must be resolved by depriving the first monosyllable of word-stress (and accordingly of its conjunctive accent) with a resulting maqef—crucially, systematically lacking a secondary metheg. Two representative minimal pairs are given in (3) that complicate the simplest picture.

\[
\begin{array}{c}
\text{(a) $F^M HW.^) Job 39:30} \\
\text{MIY-HW.^) Job 9:24}
\end{array}
\]

\[
\begin{array}{c}
\text{(b) LO^) B:YF^D} \\
\text{LO)-)IY^$ Job 32:13}
\end{array}
\]

In (3a), we find that there is a class of exceptional monosyllables that behave as if two syllables: hence long or superheavy syllables. Musically, šhā:m is realized as šhā-ām with the conjunctive mūnach assigned to the first half, and the second half providing the required buffer. If we then extend the data-set to cases with an intervening, otherwise extrametrical shwa, we find another class of systematic exceptions (3b): the preceding monosyllable is open, and the combination of open syllable plus vocal shwa yields a secondary beat as in (3a).

The explanation must be something like (4), where μ indicates where the mora is assigned; in linguistic terms, these are the coda segments of the underlying syllable.

\[
\begin{array}{c}
\text{(a) YKTB} \\
\text{y i k t o o b}
\end{array}
\]

\[
\begin{array}{c}
\text{(b) +WB} \\
t o o b
\end{array}
\]

Where the long vowel results from tonic lengthening, there is no additional weight since there is no corresponding coda segment (4a); whereas, if the long vowel is associated with a historically and lexically long vowel, there is additional weight because supported by an additional coda segment (4b). If we assign metrical weight to the underlying representations as in (4), we thereby explain the clash data.
Furthermore, if with Khan we assimilate the cases in (3b) to the representation in (4b), we obtain a linguistically plausible generalization: accordingly, we would posit a *resyllabification rule* to cover the situation in (3b): there would be no difference, at the relevant level of representation, between the syllable *lo-ov* in (3a) and *to-ov* in (4a). While the example in (3b) seems somewhat bizarre and isolated, the effect is in fact prevalent throughout the phonology.

So, can we say anything further about Tiberian moras and the feet that organize them? Can we further characterize these *underlying prosodic representations* to which Tiberian phonology is sensitive?

In fact, there are a number of robust data-sets which we can examine; today we have time for long words and “virtual disjunctives”, where the phenomenon represented by (3b) plays a decisive role.

Price (1990) offers generative grammars of the two Tiberian accent-systems. The poetic system is characterized by a general transformation that converts a disjunctive accent into a conjunctive accent when clashing with another preceding disjunctive (hence, “virtual disjunctive”); however, where the conditioning disjunctive accent sits on a so-called “long word”, the transformation systematically fails. We can accordingly use the long-word phenomenon as a *prosodic diagnostic* for Tiberian Hebrew.

The basic dichotomous trope-structure is given in (5) (where *ω* is phonological word, and *φ* phonological phrase): two two-word phrases, one assigned a major disjunctive and the other assigned the corresponding minor disjunctive, for a string *conjunctive-disjunctive-conjunctive-disjunctive*.

\[
(5) \quad \phi' \\
\quad \phi \quad \phi \\
\quad \omega_c \quad \omega_d \quad \omega_c \quad \omega_D
\]

Where the minor-disjunctive phrase is defective, i.e., lacking the conjunctive as in (6), nothing happens.

\[
(6) \quad \phi' \\
\quad \phi \quad \phi \\
\quad \omega_d \quad \omega_c \quad \omega_D
\]

However, the situation in (7) is dramatically different: where a clash of disjunctives obtains, the clash is resolved by transforming the offending disjunctive into a trope-appropriate conjunctive.
(7) \[ \begin{array}{c}
\phi' \\
\phi \\
\omega_c \quad \omega_d \\
\end{array} \]

(Notice parenthetically that this is effectively **nesiga (stress retraction)** operating at a higher level of organization, which is borne out by the musical interpretation. I would prefer to generalize and claim that this iambic rhythm is superimposed at all levels of Tiberian prosody, yielding a **unified and simplified rhythm-and-clash rule**.)

The interesting question that arises is, what exactly is the nature of the resulting structure? The null hypothesis is the flat structure in (8); it is in fact the structure assumed by Revel (1987) in his nesiga study, and is supported by spirantization data.

(8) \[ \begin{array}{c}
\phi \\
\omega_c \quad \omega_d \\
\end{array} \]

However, there are a number of theoretical and empirical considerations that show some version of the left-recursive (9), in which the phrasing is maintained, must be correct. Indeed, I prefer the strong claim that all strings of conjunctives must at some level look like (9), i.e., there must be an underlying phonological phrasing that must be maintained (with important implications for the study of the prose-accentual system, *pace* Price 1990).

(9) \[ \begin{array}{c}
\phi \\
\phi' \\
\omega_c \quad \omega_d \\
\end{array} \]

On the theoretical side, one can appeal to the broader theoretical-linguistic literature in which **strict binarity** is the rule. Further, following Price (1990), strict binarity makes for an elegant specification of the phrase-structure grammar.

On the empirical side, it is important to note that while the disjunctive is transformed to a conjunctive **locally**, it nevertheless functions as a disjunctive in the larger structures **globally**. This is a deep insight arising from Price’s approach; in his terms, we are dealing with “**virtual disjunctives**”.

Furthermore, (8) and (9) make different predictions regarding the behaviour of Tiberian Hebrew phonological rules, specifically regarding the types of possible surface
violations of such rules (aka “opacity”). The data from surface-violations of nesiga, for example, support (9), in which the rhythm rule is systematically sensitive to the virtual-phrase boundary\(^2\); a significant generalization that Revell’s flat-structure approach cannot make explicitly.

However, it is often the case that the structure in (7) apparently obtains. In such striking cases, it has been noted that the conditioning word is somehow “long”. Dresher explains such situations by positing the more sophisticated representation in (10) in which feet are visible.

\[
(10) \quad \varphi' \\
\quad \varphi \quad \varphi \\
\quad \omega \quad \omega \\
\quad \omega \\
F_c \quad F_d \quad F_e \quad F_D
\]

Notice that the structure in (10) implies, crucially, that accents are assigned to prosodic feet and not directly to words. To extend Price’s terminology, we must be dealing with virtual conjunctives in such long words. (In fact, it is sometimes the case that the conjunctives are not even virtual: words can bear both a conjunctive and disjunctive in such circumstances.)

Long words come in two varieties. The typical long word has two or more metrical syllables before the tonic syllable. With Dresher, we posit at least one extra prosodic foot. There is only one apparent exception to this iron law of long words, bashalom in Ps 29:11, to which we will return.

The second and more interesting case involves open syllables with an intervening vocal shwa before the tonic syllable, analogous to the case in (3b). I say “interesting” because actually trying to formally characterize all and only the participating syllables is much more difficult than might be thought. Price (1990) refers to “full vowel” without further specification, corresponding to Wickes’s “long vowel” (elsewhere “long syllable”), who in turns assumes the incorrect 5-long-5-short scheme of Tiberian vowels; in the event, this approach is empirically inadequate, since, in Wickes’s terms, “short

\[\text{From Revell (1987), the following “virtual disjunctives” implicated in nesiga violations are obtained:}\]


**virtual legarmeh (d1?)** 5x: Job 20:27 (long word), 37:12; Ps 41:8, Ps 44:9 (selah), 77:4 (selah).


**virtual legarmeh (d3f)** 1x: Job 15:23
vowels” do also appear in long syllables. Dresher (1994) tries to capture the distinction in terms of the *metheg*, which he assumes marks secondary stress (incorrectly in my view); however, this approach is woefully inadequate empirically, since the metheg is neither necessary nor sufficient to correctly characterize all and only the superheavy syllables.

Let us take the counter-examples, some of which Wickes noted in a footnote. There is a class of seven metrically-short counter-examples (Wickes, and so Price, missed Prov. 1:32) given in (11a).

(11) “short words” that appear long

(a) YA^(AB:DW.^NIY  Ps 18:44 (cf. 27:10, 119:175; Job 6:4, 30:18; *Pr 1:32*, 29:4)
  ~ YA:(B:DW.^NIY

(b) ):AHAL:LE^K.F  Ps 22:23
  ):AHA^L:LE^N.W.  Ps 109:30

(c) CI^L:ALOW^  Job 40:22

While there are apparently two metrical syllables before the tonic syllable in (11a), and indeed one marked by *metheg*, the vowel is nevertheless “short” in Wickes’s terms. What he suggests is that these counter-examples go away if we assume the lexical representation before the *euphonic shwa rules* kick in, given as an alternative (11a).

This is a simple and obvious move, and extends to all other counter-examples: in (11b), a secondary loss of gemination has resulted in an open syllable, but crucially not a superheavy; similarly, in (11c) a secondary opening does not contribute to weight, despite a surface-long hireq marked by *metheg*. In all cases, then, we are dealing with *derivationally-late euphonic rules* involving *vocal shwas*. Accordingly, we can calculate prosodic weight correctly if we simply discount the effects of such late rules, following Wickes: we say in all cases that we are dealing with a closed unaccented syllable in the underlying lexical representation.

So simple—and so, of course, inadequate. There is a major class of long words (12) where the relevant syllable is both closed and unaccented in the lexical representation.

(12) “long words” with lexical CV(C)

(a) Y:BFR:AKE^NHW.  Ps 72:15 (cf. Ps 101:6, 145:10; Job 31:37)

(b) M"R:)OW^T  Ps 69:24 (cf. Job 33:12)

(c) B.A^(:ELIY^  Pr 27:22

(d) NOW^(:ADW.^  Ps 48:5

(e) )F^M:RW.^  Job 28:22

In all such cases, there is a geminate guttural consonant that is causing trouble: *degemination* occurs, with a so-called compensatory lengthening of the vowel. In (12a)
we find the underlying gemination characteristic of piel verbs; in (12b) the gminating nun of the preposition min; and in (12c) the gemination induced by the definite article (notice in the latter, crucially, that the syllable is surface-long despite the pathah, following Khan—again, contra Wickes).

Degemination with compensatory lengthening is not the only rule so implicated. A lexical CVC is opened by monophthongization in (12d). In (12e), we find the contextual (vs. pausal) form of the verb creating the environment for resyllabification (I have argued elsewhere [JSS 50.2 (2005)] that the pausal forms must be basic, and that the contextual forms are obtained by transformation).

The resulting division of rules is summarized in (13).

(13) rules and outputs for calculating moraic weight

<table>
<thead>
<tr>
<th>relevant rules</th>
<th>irrelevant rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>• guttural degemination (12a-c)</td>
<td>• tonic/pausal lengthening (4a)</td>
</tr>
<tr>
<td>• monophthongization (12d)</td>
<td>• anaptyxis with gutturals,</td>
</tr>
<tr>
<td>• contextual shifting (12d)</td>
<td>preceding general shwa-shwa</td>
</tr>
<tr>
<td></td>
<td>resolution (11a)</td>
</tr>
<tr>
<td></td>
<td>• euphonic degemination of</td>
</tr>
<tr>
<td></td>
<td>sonorants bearing vocal shwa</td>
</tr>
<tr>
<td></td>
<td>(11b)</td>
</tr>
<tr>
<td></td>
<td>• euphonic vocal shwa insertion (11c)</td>
</tr>
</tbody>
</table>

(N.B. the two aspects of pausal phonology appear on opposite sides of the divide: the lengthening aspect is apparently without effect, while crucially the shifting aspect is relevant.)

Before concluding, it is worth dwelling on the apparent exception in Psalm 29:11 in (14a).

(14) exception?

(a) (i) YHWH [d1] YBRK [c]  )T-(MW [c] BAS.FLOW^M          Ps 29:11
    (ii) YHWH [d] YBRK [c]  )T-(MW [d1] BAS.FLOW^M

(b) YD( [d1] KY-NKWN [c] BYDW [c] YWM-X$K       Job 15:23

Following the presumed syntax, it does appear that the minor disjunctive revia-mugrash [d1] has become “virtual” on et-`amo by rule, where in fact bashalom on silliq is a long word by the iron rule, with its definite article (14aii). Since this is the only exception, and this exception is in fact so exceptional, as clearly indicated by the masora parva, which notes just two cases of preposition beth plus shalom without the expected vocal shwa (indeed, lamedh-shwa plus shalom is exceptionless), we might be tempted to repoint the

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3 Revell’s two papers on dehiq (external gemination) can also be so reinterpreted [explore further].
preposition with a shwa, thereby making the exception go away. This repointing might be viewed as problematic for a host of reasons, however.

But as Wickes, Breuer and Price imply, there is no exception here since it must be the secondary legarmeh [d] which is “virtual” (14aiii). Furthermore, the transformation of legarmeh is insensitive to long/short-word distinctions, as can be seen elsewhere (e.g., (14b)).

This being the case, we observe the accentuation apparently disregarding the hierarchical prosodic structure, which seems deeply puzzling. In fact, Breuer suggests that poetic system does in fact disregard the hierarchical phrasing, dramatically contrasting in this respect with the prose system. What he says is that the accents are assigned within the silleq trope in a specific order, counting backwards from the athnach: first revia-mugrash (or its lawful substitute great shalsheleth), then the mahpak-legarmeh (including “virtual” legarmeh), and then the system runs out, compressing phrases where necessary, with a resulting maqqef, crucially plus metheq in such cases (as in (14b)). Dresher has suggested to me that there are deep implications here for the nature and origin of the two accent systems, above all suggesting that the poetic system appears in this light as a special-purpose system designed for the constrained lines of biblical poetry, whereas the prose system is an artificial contrivance to handle the infinite complexity of prose.

To conclude, I am making three specific proposals based on the foregoing overview. First, there is a twofold division of Tiberian phonological rules: ones whose output enters into the calculation of moraic weight, and others which are irrelevant in this respect. Accordingly, there must be some intermediate prosodic representation intervening between the lexical and surface representations, to which the Tiberian accentuation is sensitive. This opacity in turn suggests a diachronic scenario, in which the liturgical chant is devised for a Hebrew pronunciation several generations earlier, crucially one that discounts the “irrelevant” rules. The three-way contrast in (A) summarizes this proposal.

(A) three-way contrast (e.g., piel nonpast): intermediate underlying representation

(a) T.:MAG.:NE^K.F Pr 4:9 (short despite three pretonic syllables)
(b) ):AHA^L:LE^N.W. Ps 109:30 (short despite metheq marking open syllable)
(c) Y:SFR:T"^NIY Ps 101:6 (long even without metheq)

Second, the resyllabification rule in (B) must be part of that historically and derivationally earlier phonology. As a generalization, the “shwa” syllable becomes resyllabified with a preceding open syllable at the relevant level of representation. The shwa-shwa rule is already well motivated in the first case (a); the generalization (b) is quite plausible, as Khan (1987) already argued.
(B) generalized *resyllabification of shwas* before counting: \( CV \)

(a) \( CV.\ CV. \rightarrow CVC.V. \)

(b) \( CVV.\ CV. \rightarrow CVVC.V. \)

Third and finally, there is the mapping of *moraic structure* to syllable structure (C). I propose that the weight be calculated by the number of coda segments at the relevant level of representation. As Dresher has explained to me, such a system would be rare but is not unattested. The exploration of spoken languages instantiating such a metrical system is accordingly on my research agenda.

(C) Tiberian Hebrew: threefold *moraic assignment* (0-2)

<table>
<thead>
<tr>
<th>syllable type</th>
<th>mora count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \mu )</td>
</tr>
<tr>
<td>CV</td>
<td>0</td>
</tr>
<tr>
<td>CV C</td>
<td>1</td>
</tr>
<tr>
<td>CV V</td>
<td>1</td>
</tr>
<tr>
<td>CV V C</td>
<td>2</td>
</tr>
</tbody>
</table>

In conclusion, the prosodic primitive in Tiberian phonology is the *mora*, and the organizing/timing unit is the prosodic *foot*. Further, the Tiberian chant is sensitive to non-surface distinctions; why that *opacity* should obtain, and the nature and depth of derivational rule-ordering are questions that immediately arise. These rules and representations are “of great significance” to historical and comparative Semitic linguistics generally, since, as Revell points out, the phonology and accentuation of Tiberian Hebrew—“the most carefully preserved tradition”—provide “the only direct evidence” of prosody “in any Semitic language prior to European descriptions of Arabic from the early seventeenth century” (1987: 9).

In passing, these rules and representations should also be of great significance to students of biblical poetry, some of whom expend great amounts of effort and ink in counting syllables, words and stresses.
Addendum: Progress Report
I have worked out the edge-based mapping prescribed by Dresher, couched in the state-of-the-art Optimality-Theoretic framework; and have extended the analysis here to explain the behaviour of clitics, the behaviour of prosodic transformations, and the relation of transformations to nesiga and external gemination—or more precisely, the environments in which these sandhi rules fail. Working papers will be posted to the internet as warranted.

References


