How vowels point to syntactic structure: roots and skeletons in Hebrew and Italian

Noam Faust & Nicola Lampitelli

In this paper, we discuss theme vowels in Modern Hebrew and Italian. These vowels are a morphological phenomenon that cannot be attributed to the specific root or to the category-assigning head. In Modern Hebrew, theme vowels are positioned between the last two radicals, whereas in Italian they are suffixed to the root. We claim that both languages have an intermediate level which introduces these theme vowels. The difference in position follows from the non-syllabified status of Modern Hebrew roots at insertion. We further show that both languages exhibit direct merger of n and the root.

1. Introduction

Modern Hebrew (henceforth MH) displays non-concatenative morphology. The same three radicals appear in several semantically related lexical items with different interdigitated vocalizations, affixes, and prosody (=surface syllabic structure). This (usually tripartite) non-linearized morpheme is referred to as the root. We show some examples of MH roots in (1):

(1) The Modern Hebrew root ñmsr

<table>
<thead>
<tr>
<th>Nouns</th>
<th>Verbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. méser</td>
<td>masar</td>
</tr>
<tr>
<td>b. mi-msar</td>
<td>hit-maser</td>
</tr>
<tr>
<td>c. masó-r-é</td>
<td></td>
</tr>
<tr>
<td>d. ta-msir</td>
<td></td>
</tr>
<tr>
<td>e. masúr</td>
<td></td>
</tr>
</tbody>
</table>

Nouns = ‘message’; Verbs = ‘pass on, deliver’; ‘intermed. transfer’; ‘handout’; ‘devoted’

By definition, the Semitic root can never be detected in isolation; only additional material specifies it semantically and formally.

In Italian, non-derived variable nouns consist of a stem and an additional theme vowel, which may or may not carry grammatical information (-i is always plural; -o is always masculine; -e may be masculine, feminine or plural):

\[1\] This generalization has one exception: mano – mani ‘hand(s)’ is feminine.
(2) Italian variable nouns

<table>
<thead>
<tr>
<th>sg.</th>
<th>g.</th>
<th>pl.</th>
<th>g.</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td><em>lupo</em></td>
<td>M</td>
<td><em>lupi</em></td>
<td>M</td>
</tr>
<tr>
<td>b.</td>
<td><em>rosa</em></td>
<td>F</td>
<td><em>rose</em></td>
<td>F</td>
</tr>
<tr>
<td>c.</td>
<td><em>cane</em></td>
<td>M</td>
<td><em>cani</em></td>
<td>M</td>
</tr>
<tr>
<td>d.</td>
<td><em>nave</em></td>
<td>F</td>
<td><em>navi</em></td>
<td>F</td>
</tr>
<tr>
<td>e.</td>
<td><em>poeta</em></td>
<td>M</td>
<td><em>poeti</em></td>
<td>M</td>
</tr>
<tr>
<td>f.</td>
<td><em>ala</em></td>
<td>F</td>
<td><em>ali</em></td>
<td>F</td>
</tr>
<tr>
<td>g.</td>
<td><em>lup</em></td>
<td>M or F</td>
<td><em>lup</em></td>
<td>M or F</td>
</tr>
<tr>
<td>h.</td>
<td><em>ros</em></td>
<td>M or F</td>
<td><em>ros</em></td>
<td>M or F</td>
</tr>
</tbody>
</table>

The Italian stem, like the MH root, is also never found in isolation (cf. (2.g/h)). Recent work in morphology (Marantz 1997) has adopted the tradition of calling such stems Roots.

This short paper examines this parallelism. We aim to characterize the lowest morphological architecture and the nature of its ingredients: the Root, the first category assigning head and the relation between them. We propose that this relation is often not direct, but rather that there is an intermediate level (which we call Tem(plate)P) between a nominal head and the root it is attached to. This is the level at which the Romance Theme-Vowel/Semitic vocalization is introduced.

Some items (in both languages) do not bear the components we characterize as contributed by TemP. We propose that the existence of this intermediate level is not obligatory; these items, we suggest, are best analyzed as cases of direct merger of n-head and root. This analysis accounts for other, seemingly independent aspects of their distribution. This is how vowels point to syntactic structure.

The effects of TemP or its absence are different in the two languages. We propose that this difference is the consequence of a morphophonological feature of roots: MH roots lack skeletal material (a CV tier), whereas Italian roots are fully skeletalized. While this statement is far from controversial, its implications have not been examined in detail. They are shown to be crucial in the case of such direct merger of the n-head and the Root.

The paper proceeds as follows. Section 2 presents some theoretical preliminaries. Section 3 motivates TemP independently in MH and Italian. In section 4, we show that the same structure (with TemP) neatly accounts for the vast majority of nouns in both languages, if one assumes the difference between their respected roots mentioned above. Section 5 explores a case of what we claim is direct merger, and shows that it exists in both languages. Section 6 summarizes our proposals.

2. Theoretical preliminaries

Working within the Syntax-based framework of Distributed Morphology (Halle & Marantz 1993; Marantz 1997, 2001), we assume the basic form of a noun in (3). The present study will be concerned only with the range between NumP and the Root. As the diagram shows, the spelt-out forms of a head may be skeletalized (=syllabified) or not. We assume, following Lowenstamm (1996), that the only skeletal constituent is a CV unit. In concentrating on the relation between syntactic nodes and minimal phonological material, we follow the specific implementation of Distributed Morphology found in Piggott & Newell (2006) and Lowenstamm (2008) and similar work.
(3) Basic Nominal structure

```
D → DP
   /|
  num → numP
     / |
   n  → nP
      /\ |
(CV) (CV) (CV)
```

The spelled-out form of a certain head or feature can be of several kinds. Leaving aside empty and expletive markers, the following three types of spell-out are identified in Bendjaballah & Haiden (2008):

(4) Types of spell-out

a. segmental (floating)  b. skeletal  c. segmental & skeletal

```
ka       k a
|   |   |
CV   CV
```

Especially important in the understanding of our analysis is the Theory of Elements (Kaye et al. 1985, henceforth KLV). According to that theory, segments consist of elements and their combination. Here we will only be concerned with the inner structure of vowels, presented in (5). Simplex vowels consist of only one element; complex vowels are the combination of two elements.

(5) Simplex and Complex vowels

a. \[a\] = /A/  b. \(i\) = /I/  c. \(u\) = /U/

d. \([e]\) = /I.A/  e. \([o]\) = /U.A/

3. An intermediate level between \(n\) and the root

3.1. Modern Hebrew and Italian roots

We have seen in (4) that a spelled-out form can be segmental, skeletal or both. The question is now raised as to the nature of the spelled-out form of the root: we will see that MH and Italian differ in this respect.

Let us start with Italian roots and make the following observations. First, the root is a pronounceable stem. Secondly, such radical stems may not be infixed: they are linearized and impenetrable. Thirdly, there is no limitation on the number of consonants or vowels in this stem (phonological constraints aside).

These characteristics are not found in MH roots. These are non-pronounceable, abstract morphemes. They are limited (in principle) to three radicals which \textit{a-priori} associate to consonantal positions. As a consequence, additional material can be inserted \textit{between} the radicals.

These points are not new. That MH (and Semitic) roots, unlike Romance roots, are discontinuous is evident. But what does this difference point to? We propose that the discontinuity exhibited by Semitic roots (and, in fact, non-concatenative morphology in general) is a consequence of their exclusively segmental (i.e. not skeletalized) nature. An MH
root enters the derivation with no skeletal material. Italian roots, on the contrary, are fully skeletalized.²

If so, the skeleton for the root in MH has a different origin than in Italian. As we will see, skeletal material is provided by the structure that the root is inserted into. This view is supported by another difference between MH and Italian items (as opposed to roots): in Italian, the internal prosody of the item is not indicative of its lexical category: a CCVCV sequence may be a noun, a verb, an adjective etc. This follows if Italian roots are inserted with their skeleton. But in MH, as we will see, the internal prosody may be indicative of lexical category: a sequence CCVC in isolation can only be a noun, but CaCVC can be either a noun or an adjective. This fact can only be explained if one assumes that the root lacks skeletal material, and that this material is provided by additional structure.

We will come back to these points later. We now move to the examination of the data and structures of both languages.

### 3.2 “Theme Vowels” in Modern Hebrew

As mentioned, Semitic roots cannot appear in isolation; they surface only as combined with further lexical material, referred to as the template. Every template has at least one lexical site between the radicals, which hosts the distinctive vocalization of that item. For example, the items *katan* ‘small’ and *katin* ‘juvenile person’ have the same template QaTV₂L, with a lexical site in V₂. (Q,T,L standing for the root consonants). The only difference is the quality of the vowel (in bold) that fills that position, i.e. their vocalization.

V₂ is the lexical site in all templates in Modern Hebrew, as elsewhere in Semitic: any vowel may be found in this position. The vowel in V₁, in contrast, is very rarely other than *i* or *a*. The vowels in V₂ are thus referred to as the “theme” of the item (e.g. Goldenberg 1994). Stress is final if not marked.

(6) MH nouns (cf. Faust In prep.)

<table>
<thead>
<tr>
<th>Template</th>
<th>sg.</th>
<th>g.</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>/QTvL/</td>
<td>a.</td>
<td>klf M</td>
<td>‘card’</td>
</tr>
<tr>
<td></td>
<td>b.</td>
<td>bdixa F</td>
<td>‘joke’</td>
</tr>
<tr>
<td>/maQTvL/</td>
<td>e.</td>
<td>macpun M</td>
<td>‘conscience’</td>
</tr>
<tr>
<td></td>
<td>f.</td>
<td>makpeca F</td>
<td>‘trampoline’</td>
</tr>
<tr>
<td>/miQTvL/</td>
<td>g.</td>
<td>mixšol M</td>
<td>‘obstacle’</td>
</tr>
<tr>
<td></td>
<td>h.</td>
<td>mištara F</td>
<td>‘police’</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Template</th>
<th>sg.</th>
<th>g.</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>/QaTvL/</td>
<td>c.</td>
<td>rajiš M</td>
<td>‘sensitive’</td>
</tr>
<tr>
<td></td>
<td>d.</td>
<td>kvuca F</td>
<td>‘group’</td>
</tr>
<tr>
<td>(h)VTiL</td>
<td>i.</td>
<td>hikpic–yakpic</td>
<td>‘jump (caus.)’</td>
</tr>
<tr>
<td>QTTeL</td>
<td>j.</td>
<td>kipec–yekapec</td>
<td>‘jump (iter.)’</td>
</tr>
<tr>
<td>QaTvL</td>
<td>l.</td>
<td>kafac–yikfoc</td>
<td>‘jump’</td>
</tr>
</tbody>
</table>

Indeed, the V₂ vocalizations in (6) behave not unlike Romance theme vowels. On the one
hand, we observe that the presence of a lexically determined vowel in V₂ is true regardless of the category. It is thus not a property of one specific category-defining head. On the other hand, one cannot say that V₂ is part of the root, since the same root may appear with different vocalizations in V₂. These facts lead us to conclude that there is an intermediate projection between the root and the category-assigning head that introduces V₂. We call this projection TemP.

3.3 “Theme Vowels” in Italian

As shown in (2) above, a general feature of Italian nouns is that they must end in a vowel, the only exception being loanwords such as film ‘movie’. This final vowel changes according to the number feature of the noun. An important property distinguishes two different groups of nouns: if the final vowel is stressed, then i) [a], [i], [e], [o] and [u] are allowed; and ii) the noun is invariable - the final vowel is the same for both plural and singular (virtù ‘virtue (sg. or pl.)’). On the other hand, if the final vowel is unstressed, then i) the vowel [u] is excluded; and ii) the noun is variable. The data in (2), which represent the vast majority of Italian nouns, belong to this second set. Their final vowels are often referred to as “theme” vowels. We will refer to them as Vₚᵢᵥ. The set of possible Vₚᵢᵥ vowels is presented in (7):

(7) Vₚᵢᵥ inventory
   a. Singular                      b. Plural
     e                           i
     o                           e
     a

We recast these data as in (8), decomposing each Vₚᵢᵥ according to the Theory of Elements (cf. supra (5)):

(8) Decomposed Vₚᵢᵥ
   a. Singular                      b. Plural
      I
     A.I                           A.U
     A.I

The analysis in (8) points to the following generalization: /A/ must always be present in the singular while /I/ is always present in the plural. Both /A/ and /I/ may appear alone, whereas the element /U/ cannot. Lampitelli (2009) proposes the following definition for /A/ and /I/³:

(9) Number markers
   a. /A/ marks the singular (henceforth Asg)
   b. /I/ marks the plural (henceforth Ipl)

In the light of (9), we propose to regard Vₚᵢᵥ as the result of the phonological fusion between two distinct elements, one being the number marker the other being an unpredictable and undefined element as shown in (10):

³ Passino (2008a) explores a similar analytic path. Acquaviva (2008b) does not decompose these theme vowels, but argues that they represent the fusion between gender and number.
(10) Decomposing $V_{\text{fin}}$

<table>
<thead>
<tr>
<th></th>
<th>$V_{\text{fin}}$</th>
<th>$V_{\text{fin}}$</th>
<th>gender</th>
<th>class</th>
<th>examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Asg + $U$</td>
<td>M</td>
<td>Ipl + $U^1$</td>
<td>M</td>
<td>{1}</td>
<td>lupo</td>
</tr>
<tr>
<td>b. Asg + $A$</td>
<td>F</td>
<td>Ipl + $A$</td>
<td>F</td>
<td>{1}</td>
<td>rosa</td>
</tr>
<tr>
<td>c. Asg + $I$</td>
<td>M/F</td>
<td>Ipl + $I$</td>
<td>M/F</td>
<td>{2}</td>
<td>cane, nave</td>
</tr>
<tr>
<td>d. Asg + $\emptyset$</td>
<td>M/F</td>
<td>Ipl + $\emptyset$</td>
<td>M/F</td>
<td>-</td>
<td>poeta, ala</td>
</tr>
</tbody>
</table>

Number markers are totally predictable: in the structure in (3) above, they are introduced by the projection numP. The main point obviated by (10) is that the exponent of gender is not stable: for instance, a [feminine] feature can correspond to either /$A$/ or /$I$/ (10b,c), and this is not a predictable property. We thus propose the classification in (10): in class {1}, /$U$/ and /$A$/ express M and F, respectively; in class {2}, /$I$/ expresses both genders. In other words, there are class diacritics involved. Assuming that all that nouns contribute to the structure is gender$^6$, these diacritics cannot be carried by the n-head. On the other hand, they cannot belong to the root either, as roots may not bear diacritics or labels (cf. Marantz 2001; Acquaviva 2008a; contra Embick & Halle 2005). An intermediate level is required.

Proposing an intermediate level entails making the claim that $V_{\text{fin}}$ is not just a property of nouns, because it is introduced lower than the category-assigning head, and could in principle serve as the basis for other categories. Indeed, Italian adjectives and verbs also carry such thematic vowels. We conclude that the information on class is introduced in the structure by the projection TemP.

4. The unified analysis: MH and Italian use the same ingredients

The previous section showed that both MH and Italian have an Intermediate level between the root and the nominalizing head. This level was labeled TemP. This section shows how this idea is implemented and how the syntactic structure is linearized in each language.

We analyze the nouns that carry the morphological markers introduced by TemP as involving the structure in (11):

(11) MH and IT nouns structure (default):

In the structures that follow, the head Tem introduces that lexical material which on the one hand is not indicative of a lexical category and on the other does not belong to the root.

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4 KLV’s Theory of Elements predicts that in a five-vowel language like Italian, front rounded vowels can’t exist (*[y], *[œ], *[ø], etc.): the combination /$U$/ would result in this illicit [y]. Cf. Passino (2008a).

5 Lampitelli (2009) assumes that two different /$A$/ exist in the structure of rosa-type nouns.

6 Kihm (2002) and Lowenstamm (2008) argue that gender is a property of $n$. 
Merger of the root and TemP results in the arbitrary aspects of the form of an item. Higher in the structure, the category and number markers (in the case of nouns) are added.

Let us start with an example from MH. In (12), a derivational site is activated within the root by the merger of a templatic head. By assumption, all templatic heads activate the CV₂ position. The vowel that accompanies CV₂ spells out a class diacritic on the Tem head. Only a subset of MH roots can be inserted in this structure (see Acquaviva 2008a). This subset of roots includes √klp, √zmn and √ktb, which will eventually result in the nouns klaf ‘card’ zman ‘time’ and ktab ‘writing’; but the set also includes the basic ingredients for other nouns (bacal ‘onion’) or adjectives (katan ‘small) and possibly even verbs of the first group (e.g. gadal-yigdal ‘grow’). Whatever the root, it is provided one skeletal CV constituent, and that constituent always ends up hosting the penultimate consonant (l in (12b)), alongside the lexical vowel.

(12) klaf ‘card’, M sg.

<table>
<thead>
<tr>
<th>a. Structure</th>
<th>b. linearization</th>
</tr>
</thead>
<tbody>
<tr>
<td>TemP</td>
<td>CVₚtem</td>
</tr>
<tr>
<td>Temₐ √</td>
<td>k l a p</td>
</tr>
<tr>
<td>CV₂</td>
<td>klp (clb, ktb, zmn, but also xlb…)</td>
</tr>
<tr>
<td>/a/</td>
<td></td>
</tr>
</tbody>
</table>

The linearization in (12b) is only given for representational purposes. In fact, TemP cannot be spelled out on its own, because it is not a lexical category. Lexical categories are introduced by additional structure. (13) demonstrates this for a noun derived from (12):

(13) klaf ‘card’, M sg.

<table>
<thead>
<tr>
<th>a. Structure</th>
<th>b. linearization</th>
</tr>
</thead>
<tbody>
<tr>
<td>numP</td>
<td>CVₙ CVₚtem&lt;CV&gt; =&gt; [klaf]</td>
</tr>
<tr>
<td>num</td>
<td>k l a p</td>
</tr>
<tr>
<td>n</td>
<td>TemP</td>
</tr>
<tr>
<td></td>
<td>Temₐ √</td>
</tr>
<tr>
<td>α</td>
<td>CV</td>
</tr>
<tr>
<td></td>
<td>/a/</td>
</tr>
</tbody>
</table>

Nominal heads, like other major lexical categories, introduce at least one CV unit
When the template is nominalized, another CV constituent is added to the structure (marked above as CV_{n}). Further up, [sg] is just the lack of any feature on the num head in MH. Therefore, no CV constituent is added by the num head.

This structure is linearized as in (13b). The initial radical \(k\) is linked to CV_{n}. The final radical \(p\), which does not have a skeletal position to be linked to, is provided one by an automatic process of skeletalization: such positions are marked with angled brackets \(<CV>\). This process is strictly phonological, and does not participate in morphological process; parts of the word that are thus skeletalized correspond to what is referred to as extrametrical syllables.

To summarize, the root enters the derivation with no skeletal material. A projection TemP provides a thematic vowel linked to a skeletal position. These are mapped to an internal position between the last two radicals. A category-assigning head merges with this structure, adding at least one other CV unit. Only CV positions provided by the structure are available for morphological processes. This is the end of morphological derivation; what follows is just phonological computation.

Moving on to Italian, consider the noun *lupo* ‘wolf’ in (14). Like in MH, the root initially merges with a templatic head Tem. This head adds its own CV constituent (CV_{fin} below). As in MH, this head carries a diacritic (“{1}” below) that determines which roots may be combined with it. In (14) it is the root /\sqrt{lup}/, but the same structure underlies *trampolo* ‘stilt’ *strato* ‘layer’ *nucleo* ‘nucleus’.

As in MH, TemP is only the partial structure of a noun. In Italian this is even clearer, since the spelled-out form of the class diacritic may be conditioned by the gender value on the nominal head. It is the element /U/ if \(n\) is [-f], /A/ if it is [+f]. In (14), the nominal head carries the gender [-f], and so the class vowel will be spelled out as U. Further up, number is specified as [-pl]. Regardless of class, this feature is always spelled out as A.

This structure is linearized as in (14b). The elements U and A combine to give the V_{fin} vowel [o].

7 We ignore here the question of the position of CV_{n}. Rucart (2006) evokes the contrast between Merge and Move for the realization of an affix as a prefix (Merge) or a suffix (Move). If he is correct, then there is no movement involved in the merger of \(n\) and TemP. Indeed, as we will see, \(n\) does not carry uninterpretable features that could motivate such movement, as it can be merged directly with the root as well.
The only fundamental difference between MH and Italian is that in the former roots enter the structure with no skeletal positions, whereas in the latter they are inserted with such a skeleton. That the positions and vowels introduced by TemP are internal in MH and external (suffixal) in Italian is a consequence of this fact. That aside, the structure of basic nouns in the two languages is strikingly analogous.

The next section attempts to push this analogy further.

5. Direct merger

We have seen that most items in MH have a lexical vowel in V₂. A certain group of nouns stands out in this respect. It is presented in (15):

(15) MH QV₁Te₂L

<table>
<thead>
<tr>
<th>sg.</th>
<th>fm.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. séfer</td>
<td>'book'</td>
<td>sûra</td>
</tr>
<tr>
<td>b. kélev</td>
<td>'dog'</td>
<td>kalba</td>
</tr>
<tr>
<td>c. xófeš</td>
<td>'liberty'</td>
<td>xufaša</td>
</tr>
<tr>
<td>d. váʔad</td>
<td>'council'</td>
<td>vaʔada</td>
</tr>
<tr>
<td>e. zóhar</td>
<td>'shining'</td>
<td>-</td>
</tr>
</tbody>
</table>

The items in (15) are traditionally called “segholates” (owing to the name of the symbol for the vowel [e] in Biblical Hebrew). Abstracting away from the alternating quality of their V₁ vowel, it is quite clear that this position, and not V₂, is the lexical site in these nouns. Indeed, the vowel in V₂ alternates with zero, and its quality is predictable from the surrounding consonants: next to a radical /a/ (or a historical guttural) it is [a] (15d,e); elsewhere it is [e] (15a-c). In the terms of Government Phonology (Kaye et al. 1990), there is no vowel in V₂: if the empty nucleus between the last two radical is pronounced, it is due to a restriction on word final consonant clusters.

Finally, segholates can only be nouns. They are thus a class apart because of three properties: i) Their non-final stress; ii) their lack of V₂ vocalization; and iii) Their exclusively nominal nature.

Properties i) and ii) are clearly related: stress cannot be assigned to V₂ because there is no vowel there. It is assigned to V₁ (sefr=>séfr) and then phonology applies and the cluster is broken (séfr=>séfer). This analysis has two drawbacks. First, it assumes that stress applies before epenthesis. The derivational view that this implies is not uncontroversial. Second, and more importantly, it fails to explain the third property. Why should it be that items with a lexical V₁ are exclusively nominal?

A view that builds templates gradually in the manner described above can account for these three properties at once. According to such a view, the lack of a lexical V₂ is an

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8 That said, non-Semitic languages may come to have roots that are only partially skeletalized: this is arguably the case of French √chat ‘cat’, which is pronounced [ša] but clearly carries a final t, detectable in [šató] ‘kitten’.

9 That empty nuclei in MH are realized as described can be seen in the following data. The V₁ vowel /a/ of QaTvL adjectives only surfaces in the penultimate syllable. When the plural suffix -im is added, V₁ is no longer penultimate, and the vowel does not surface: paxis-puxisim ‘flattened (ms.-pl.)’. If this results in an illicit cluster, the cluster is broken by a vowel [e]: laxúc-lexełxim ‘pressed (ms.-pl.)’. If the first consonant of the cluster is a guttural, it is the vowel [a] that surfaces in the V₁ position: haris-harasim ‘destroyed (ms.-pl.)’.
indication as to the structure of segholates: they do not involve TemP. Instead, they spell out a direct merger of a category defining head and the bare root (16):


\[
\begin{align*}
 & a. \text{Structure} & b. \text{linearization} \\
 & \text{nP} & \text{CV}_n \\
 & \text{n} & \sqrt{s \ p \ r} \\
 & \text{CV}_n & \text{spr}
\end{align*}
\]

Such an analysis naturally explains the exclusively nominal nature of segholates: direct merger of \( n \) with the root can only yield a noun. Direct merger can also explain the position of the lexical vowel. Like in (13) above, the \( n \)-head is spelled out as a single CV position, and this position is linked to the first radical. Because of the lack of TemP, this is the only piece of skeleton provided by the structure. It will thus be the only position that the morphological process of stress can make reference to.

The linearization of the structure in (16) proceeds as in (17). The vowel that fills the only lexical position is inserted for the given root. This output is sent to the phonology. The first radical is linked to the syntactic skeletal position, and the two remaining radical are skeletalized by default. This part of the skeleton is thus an extrametrical edge; it is ignored by stress.


\[
\begin{align*}
 & \text{Syntax} & \text{Phonology} \\
 & \text{skeletal spell-out} & \text{well-formedness} \\
 & \text{Lexical Vowel} & \text{skeletalization} \\
 & \text{insertion} & \\
 & s \ p \ r & s \ p \ r \\
 & \text{CV}_n & \text{CV}_n \\
 & \text{e} & \text{e} \\
 & \rightarrow & \rightarrow \\
 & \text{CV} < \text{CV} \text{CV}> & /\text{sepr}/ \Rightarrow \text{séfer}
\end{align*}
\]

A segholate, if so, is the nominalization of a bare root, with no further information. One may still ask how the vocalization of a segholate is determined, that is, how do we know if V1 will have an underlying /a/ (kélev-kalba) or an underlying /i/ (séfer-sifra). We have seen that TemP bore class diacritics that pointed to the vowel to be inserted in V2. This was important in accounting for the appearance of the same root with two different V2 vocalizations (katan ‘small’ katin ‘underage’). The \( n \)-head, however, cannot carry such diacritics; that would amount to “hiding” TemP information under \( n \).

Fortunately, this is not necessary. Because segholates are direct nominalizations of roots, the implicit claim is made that the V1 vocalization they surface with is just a matter of a list: it may not be contrastive. And indeed, not one case was found where the same root surfaces
How vowels point to syntactic structure

The only significant fact about segholates is that they don’t have a vowel in V₂.¹¹

The analogy to MH predicts that direct merger should also be possible in Italian. This analogy also tells us how to look for: if in MH we examined items with no V₂, we should look for cases with no Vfin in Italian.

Such cases are absent from the “native” vocabulary of Italian. But they abound in loans. (18) demonstrates:

(18) Consonant final nouns in Italian
a. film ‘film’
   b. šot ‘shot (of alcohol)’
   c. ananas ‘pineapple’
   d. bancomat ‘cash distributor’
   e. kebab ‘shawarma sandwich’

Interestingly, these nouns are invariable, i.e. they do not exhibit additional class or number morphology. This is surprising because the unattested *filmo would be a perfectly legitimate noun in Italian (other, older loans have been integrated and do carry number morphology: bistecca ‘beef steak’). This invariability must stem from structural restrictions; notice that other languages have perfectly regular number morphology on loaned nouns (MH ámbreks- ámbreksim ‘armbreak (sg.-pl.)’; Spanish: líder-lideres ‘leader (sg.-pl.)’). An account of the behaviour of the nouns in (18) has to explain the lack of number morphology.

The analogy to segholates does exactly that. A noun like film is represented as in (19):

(19) Direct merger in Italian: film M sg.

The only thing that nouns like film lack when contrasted to other nouns is the position Vfin. This lack has a consequence: recall that it was this position that accommodated both the class and the number marking of regular nouns. Nouns with no TemP are therefore prevented from showing any number morphology. This is illustrated in (19b), where the singular number

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¹⁰ There are no QaTL–QiTL pairs. Two pairs QéTeL-QóTeL were found, but they are less clearly derived from the same root: réga ‘moment’ vs. róga ‘calmness’; émek ‘valley’ vs. ómek ‘depth’. Moreover, in these cases the vocalization with o does add information to the item (something like “abstract”).

¹¹ The view of the vowel in V₁ as unimportant is supported by other aspects of the morpho-phonological behavior of segholates, three of which we will only mention here: i. the predictability of V₁ before gutturals (it is always [a] as in (13d)), typical of “filler” vowels; ii. The disappearance of V₁ in plural formations (kélev-klavim ‘dog (sg-pl)’); and iii) the low resistance of segholate vocalisation to imposed templatic vocalization (dēgel ‘flag’, digli ‘my flag’ but daglan ‘flag bearer’, *diglan).
marking remains afloat because of the lack of the position $V_{\text{fin}}$ (cf. (20) and the related discussion).

The claim that loanwords in Italian lack the specific piece of structure we have been calling $\text{TemP}$ is thus doubly motivated: it explains both the lack of class marking and the lack of number marking.\footnote{The final consonant of loans such as $\text{šot}$ ‘shot (alcohol)’ is often geminanted [šott]. Passino (2008b) is an in-depth phonological analysis of this phenomenon. In this book, the author claims that the source of this gemination is “an empty CV projected by syntax to mark the end of the utterance” (p. 91). That as may be, this phenomenon is not to be confused with $\text{TemP}$. If this additional CV position were analogous to the one provided by the $\text{Tem}$ head, we would not be able to explain the invariability of loans with respect to number.}

Before we conclude, we would like to make one further point, which will remain internal to Italian. The above analysis of $\text{film}$ presupposes that number marking on the noun is dependent on a position $V_{\text{fin}}$, provided only by the head $\text{Tem}$. Still, one might claim that it is not the position (i.e. the skeletal material) that conditions number marking, but rather the segmental existence of a class marker (i.e. the segmental material: U, A, I). According to such a view, $A_{\text{sg}}$ would not be realized in (19b) because it has no class vowel to combine with.

Now consider a noun like $\text{problema}$ ‘problem’. Indeed, such nouns seem to be problematic: they are almost all masculine, but carry a $V_{\text{fin}}$ marking /A/ that is usually associated with feminine nouns. This problematicity vanishes if we assume that in this case $\text{TemP}$ provides only a position, with no segmental spell-out. The final A is not a class marker; it is the regular spell-out of a number head, $A_{\text{sg}}$.

This view is supported by the alternation of this final vowel with $I_{\text{pl}}$ in $\text{problemi}$. If the final A were a regular class vowel, we’d expect it to behave like the vowel of $\text{rosa}$ ‘rose’, to which $I_{\text{pl}}$ is only added to yield $\text{rose}$. But if the final vowel of $\text{problema}$ is simply the exponent of singular number, then we predict its absence from the plural form $\text{problemi}$. The structure of $\text{problema}$ is shown in (20). As in (10) above, we assume that such nouns simply have no diacritic on the $\text{Tem}$ head.

\begin{align}
(20) & \quad \text{problema ‘problem’ M sg.} \\
& \quad \begin{array}{ll}
\text{a. Structure} & \text{b. linearization} \\
\text{numP} & \text{CVCV/CVCV-CV-[CV_{\text{fin}}] } \\
\quad \text{num} & \quad \Rightarrow \text{[problema/i]} \\
\quad \text{nP} & \quad \text{p r o b l e m} /A_{\text{sg}} \sim I_{\text{pl}}/ \\
\quad \text{n}_{[-}\text{f}] & \quad \text{p r o b l e m} \\
\quad \text{TemP} & \quad \text{(dilemm, poet, morfem)} \\
\quad \text{Tem} & \quad \text{p r o b l e m} \\
\quad \text{[CV_{\text{fin}}]} & \quad \text{p r o b l e m} \\
\end{array}
\end{align}

To summarize, $\text{problema}$-type nouns support i) the view of $\text{Tem}$ as providing skeletal - but not necessarily segmental - material; and ii) the analysis of $\text{film}$ as not having this skeletal material, whence the absence of number morphology.
This section has shown that there are cases in both MH and Italian that favour an analysis in terms of direct merger of a nominal head and the root. These structures do not have the intermediate level which we have called TemP. Even though the “problem” - direct merger - is the same in both languages, the effects are different: in MH, this results in restrictions on stress and lexical category, whereas in Italian it results in lack of inflectional marking.

6. Conclusion

This paper compared two unrelated languages, Modern Hebrew (Semitic) and Italian (Indo-European). It concentrated on the way roots enter the structure in these languages, and the implications that differences in this respect may have.

Semitic roots are notorious for their disregard for syllabic structure and vocalization. Indo-European roots rarely (if ever) behave in this manner. We have formalized this difference by claiming that Semitic roots enter the structure with no skeletal material, whereas Indo-European roots are (at least partially) syllabified at the stage of their initial insertion.

Provided this distinction, all other morphological differences are not fundamental and follow quite naturally. We have seen that both languages obey a morphological well-formedness condition having to do with a “theme vowel”. This pointed to a structural similarity: both languages have an intermediate level between the root and the first category assigning head. We have called this level TemP. TemP triggers a morphological process that applies to the root in order for it to be a regular item in the language. The languages are thus not different in this perspective: that the theme vowel is suffixal in Italian but infixal in MH is a consequence of the nature of their roots at insertion.

A further similarity was found in that some items in both languages spell-out direct merger with the root. This is not without price: because of the lack of TemP, such cases are predicted to show morpho-phonological peculiarities, which they do.

Finally, we have seen that both languages have all three types of spelled-out exponents: exclusively skeletal, exclusively segmental, and both segmental and skeletal. It is often said that Semitic languages are “templatic”; we have reduced this generalization to one property of Semitic roots. Beyond this fact, there is no sense in which MH is more templatic than Italian. We hope this paper will constitute a (modest) step towards the comprehension of the differences - and similarities - between concatenative and non-concatenative morphological systems.

To conclude, let us say a word about the strategy employed in the present analysis. We began by treating the form of lexical items, and observing regularities in form that are essentially not phonological. These observations allowed us to gain insight into the structural similarities between the two languages. In other words, minute aspects of the form of an item were interpreted as reflecting its syntactic structure. This is how vowels point to syntactic structures. We believe this is a path worth taking.

Noam Faust  
Laboratoire de Linguistique Formelle (LLF), Université Paris 7  
faustista@yahoo.com

Nicola Lampitelli  
Laboratoire de Linguistique Formelle (LLF), Université Paris 7  
nicolalampitelli@gmail.com
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