Issues in non-concatenative Morpho-phonology

The root controversy
# The Root (of all evil)

**Modern Hebrew** (representative of Semitic in general)

<table>
<thead>
<tr>
<th>Nouns</th>
<th>Verbs</th>
<th>Adjectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. kódem</td>
<td>l. kadam</td>
<td></td>
</tr>
<tr>
<td>‘before’</td>
<td>‘precede’</td>
<td></td>
</tr>
<tr>
<td>b. kidum</td>
<td>m. kidem</td>
<td></td>
</tr>
<tr>
<td>‘promotion’</td>
<td>‘promote X’</td>
<td></td>
</tr>
<tr>
<td>c. mikdama</td>
<td>n. hikdim</td>
<td></td>
</tr>
<tr>
<td>‘advance’</td>
<td>‘be/put ahead’</td>
<td></td>
</tr>
<tr>
<td>d. takdim</td>
<td>o. hitkadem</td>
<td></td>
</tr>
<tr>
<td>‘precedence’</td>
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<tr>
<td>e. kédem</td>
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<tr>
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</tr>
<tr>
<td>f. hakdama</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘prologue’</td>
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<tr>
<td>g. kadíma</td>
<td>p. kadum</td>
<td></td>
</tr>
<tr>
<td>‘ahead!’</td>
<td>‘ancient’</td>
<td></td>
</tr>
<tr>
<td>h. kidma</td>
<td>q. kadmon</td>
<td></td>
</tr>
<tr>
<td>‘progress (tech.)’</td>
<td></td>
<td>‘prehistoric’</td>
</tr>
<tr>
<td>i. hitkadmut</td>
<td>r. kidm-i</td>
<td></td>
</tr>
<tr>
<td>‘progress (proc.)’</td>
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<td>‘frontal’</td>
</tr>
<tr>
<td>j. hekdem</td>
<td>s. makdim</td>
<td></td>
</tr>
<tr>
<td>‘asap’</td>
<td>‘preparatory’</td>
<td></td>
</tr>
<tr>
<td>k. kdam-</td>
<td>t. mukdam</td>
<td></td>
</tr>
<tr>
<td>‘pre-’</td>
<td>‘early’</td>
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The Root (of all evil)

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The basis for all of these words is a tripartite set <k,d,m>. It has a vague meaning of ‘precedence’.
The Root (of all evil)

- This set is called “the root”.

- It is **linear**, but potentially **discontinuous** – the order matters, but things can intervene.
Root and template

In order to derive a word in Semitic, this set is combined with a template.

```
Root + Template

Root: \( \sqrt{k\ d\ m} \)
Skeleton: C V C V C
Vocalization: a u
```

[kadum] ‘ancient’

The template is a morpheme in its own right, like any affix in less spectacular languages.
Root and template

It can therefore combine with other roots:

\[
\text{Root} \quad + \quad \sqrt{ʃ} m _ { ʁ } + \text{skeleton C V C V C} \quad [ʃamuʁ] \, \text{‘preserved’}
\]

Both words are participial adjectives: this is the morpho-syntactic import of the template.
Root and template

The process is **non-concatenative** morphology: the root and affix do not seem to be order linearly in any way.

Root
+ $\sqrt{ʃmʁ}$

Template

- skeleton $C\ V\ C\ V\ C$
- vocalization $au$

They are simply combined with one another.
A note on non-concatenative impostors

**Spanish**
- lok-o ‘crazy.ms’
- lok-it-o ‘dim’
- lok-a ‘crazy.fm’
- lok-it-a ‘dim’

**Breton**
- bʁøːʁ ‘brother’
- u pʁøːʁ ‘2sg poss’
- mam ‘mother’
- u məm ‘2sg poss’
- wet ‘age’
- u hwet ‘2sg poss’

**Chaha**
- dɨmd ‘assemble’
- dɨmdj ‘2fmsg’
- nɨgɨf ‘fall’
- nɨgɨf ‘2fmsg’
A note on non-concatenative impostors

<table>
<thead>
<tr>
<th>Language</th>
<th>Word 1</th>
<th>Word 2</th>
<th>Prefix</th>
<th>Meaning</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish</td>
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<td>'crazy.ms'</td>
<td>lok-it-o</td>
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These are "floating" exponents, but it is clear that they are either suffixed or prefixed, i.e. linear.
Problems with root-and-template

Only Afro-Asiatic languages, and among them principally Semitic ones, have entirely dicontinuous roots: non-root exponents can appear anywhere among the root elements, which can be adjacent or separated.

compare *sing, sang, sung, song* – quite common.
Problems with root-and-template

• How cognitively real is the root?
• How special are these languages?
• What is phonological in root and template and what is simply set?
• Do we really need the skeleton? maybe the vocalization is enough?
• What are the universal consequences of the existence of R&T systems?
Problems with root-and-template

Outi Bat El: 
Chief proponent of the no-root approach.
Problems with root-and-template

Two main issues:
1) roots are not words, speakers do not store roots.
2) Root and template is not how Semitic morphology works. Speakers do not need to store roots.
Problems with root-and-template

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1) roots are not words, speakers do not store roots.
2) Root and template is not how Semitic morphology works. Speakers do not need to store roots.
Background on Israeli Hebrew

**Active verbs**

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<thead>
<tr>
<th>Verb Form</th>
<th>Active Verb</th>
<th>Future Verb</th>
<th>Meaning</th>
</tr>
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<tbody>
<tr>
<td>QaTaL</td>
<td>dafak</td>
<td>j-idfok</td>
<td>‘knock’</td>
</tr>
<tr>
<td>jataf</td>
<td></td>
<td>j-iftof</td>
<td>‘wash’</td>
</tr>
<tr>
<td>QiTeL</td>
<td>dijek</td>
<td>je-dajek</td>
<td>‘be/make precise’</td>
</tr>
<tr>
<td>jitef</td>
<td></td>
<td>je-jatef</td>
<td>‘share’</td>
</tr>
<tr>
<td>hiQTiL</td>
<td>hifsik</td>
<td>j-afsik</td>
<td>‘stop’</td>
</tr>
<tr>
<td>hitsbiχ</td>
<td></td>
<td>j-atsbiχ</td>
<td>‘necessitate’</td>
</tr>
<tr>
<td>Active verbs</td>
<td>past</td>
<td>future</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
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suppose now that we wanted to make a verb out of the international word [fókus].
Bat El 1994 showed that there seems to be a principle of **Cluster Preservation**: the verb type will be selected which preserves the syllable structure of the base.
Bat El 1994

Bat El showed that there is a principle of **Cluster Preservation**: the verb type will be selected which preserves the syllable structure of the base.

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<tr>
<td><strong>QaTaL</strong></td>
<td>fakas</td>
<td>*j-ifkos</td>
</tr>
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<td></td>
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<td>j-ijtof</td>
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<td><strong>QiTeL</strong></td>
<td>dijek</td>
<td>je-dajek</td>
</tr>
<tr>
<td></td>
<td>fikes</td>
<td>je-fakes</td>
</tr>
<tr>
<td><strong>hiQTiL</strong></td>
<td>*hifkis</td>
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### Active verbs

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Suppose now that we wanted to make a verb out of the international word [klik].
Active verbs

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Cluster preservation rules out QaTaL; rules out QiTeL, because of a preference for no initial clusters, *klikek. (moreover, hiQTiL has [i]...
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suppose now that we wanted to make a verb out of the international word [faks].
Bat El 1994

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Cluster preservation rules out QaTaL and hiQTiL because of a preference against 3C clusters. Reduplication in QiTeL follows.

‘necessitate’
suppose now that we wanted to make a verb out of an international word with both an initial and a final cluster, such as [fliʁt].
Bat El 1994

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<td>*j-ιfl勃tæt</td>
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<tr>
<td><strong>QiTeL</strong></td>
<td>dijɛk</td>
<td>je-dajɛk</td>
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<tr>
<td><strong>hiQiTeL</strong></td>
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Cluster preservation rules out QaTaL. (It is not clear to me why hiQiTeL is ruled out, because final clusters are possible in denominal verbs.)
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What about an international word with more than three consonants, like [katalog]?
Active verbs

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<td>*j-ikttlog</td>
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<td>je-dajek</td>
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<tr>
<td>hiQTiL</td>
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<td>*j-aktlig</td>
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Cluster preservation rules out QaTaL and hiQTiL because of a preference against 3C clusters.
What is the consequence of all this?

Recall the “traditional” notion of item construction in Semitic:

1) Take a root  
   e.g. $\langle f, m, \nu \rangle$

2) match it to a template  
   e.g. QaTuL
What is the consequence of all this?

Recall the “traditional” notion of item construction in Semitic:

1) Take a root  e.g. ⟨ʃ,m,ʁ⟩
2) match it to a template  e.g. QaTuL

So Bat El says here it should be

1) Extract a root from the base  
   e.g. [faks] => ⟨f,k,s⟩
2) match it to a template.  e.g. QiTeL
What is the consequence of all this?

There must be reference to the syllabification of the base form!
But if there is an intermediary stage with only a “root”, i.e. only a set of unsyllabified consonants, then there cannot be such reference!

you expect to get *[fikes]  f k s

Q i T e L
What is the consequence of all this?

Bat El proposes another schema of morphophonological derivation which doesn’t involve the root: **Melodic Overwriting**. The vowels of the template are imposed on the base word, rather than on an extracted root:

\[
\sigma^i \sigma^e + \text{katalog} \rightarrow \text{kitaleg} \rightarrow \text{kitaleg} \]

\[
\text{σ}[i] \ σ[e] \quad \text{Mel. Over.} \quad \text{σ} \quad \text{σ} \quad \text{“stray erasure”} \quad \text{σ} \quad \text{σ} \quad \text{σ}
\]

[kitleg]
What is the consequence of all this?

Bat El proposes another schema of morpho-phonological derivation which doesn’t necessitate the root: **Melodic Overwriting**. The vowels of the template are imposed on the base word, rather than on an extracted root:

\[
\sigma_{[i]} \sigma_{[e]} + \text{katalog} \rightarrow \text{kitleg}
\]
What is the consequence of all this?

Bat El boasts another advantage, namely that cluster preservation is **not** a principle of her account; it is rather a consequence of it.
What is the consequence of all this?

Bat El then makes an interesting logical leap: if there is no need for roots in this case, is there any need for them ever?

- The stored form must be the individual word.
- An individual word can serve as the base for another
What is the consequence of all this?

The belief in the consonantal root as the basic unit of meaning is due to the stability of consonants in word formation; most of the morphophonemic alternations are vocalic. The stem consonants cannot be treated as an independent unit carrying meaning since, as in any language, the meaning is associated with the entire stem and not with the consonants. In the course of derivation some of the semantic properties of the base are transferred to the derived form, yet it does not follow that these properties are associated with the transferred consonants. In a chain of derivation such as ?amad ‘to stand’ → ?amuda ‘column’ → ?imed ‘to paginate’, the semantic properties transferred from ?amad to ?amud are not the same as those transferred from ?amuda to ?imed: yet the same set of consonants appears in the two derived forms.
What is the consequence of all this?

All the participating principles and processes of Stem Modification are available within general prosodic theory and are active in languages which are not considered typologically Semitic.

“It is my contention that in the light of recent theoretical developments, reconsideration of that unit is certainly opportune”
What is the consequence of all this?

All the participating principles and processes of Stem Modification are available within general prosodic theory and are active in languages which are not considered typologically Semitic. This, and the elimination of the

“It is my contention that in the light of recent theoretical developments, reconsideration of that unit is certainly opportune”
Appraisal of Bat El’s arguments

Falacy no. 1

• What Bat El 1994 proved was that in deriving a verb **from an existing word**, one must take into account that word, and not an extracted root.

• That is **not** proof that roots do not exist in verbs that are not clearly denominal.
Appraisal of Bat El’s arguments

Falacy no. 1

• What Bat El 1994 proved was that in deriving a verb from an existing word, one must take into account that noun, and not an extracted root.

Still, Bat El could claim that she only has one mechanism of word-formation, while the traditional view has to have one for denominal verbs, one for deradical verbs.

We will return to this point.

• That is not proof that roots do not exist in verbs that are not clearly denominal.
Appraisal of Bat El’s arguments

Falacy no. 2

• Consider IH-internal félet ‘sign’ => filet ‘put signs’, knas ‘fine’ => kanas ‘to give a fine’

• For such verbs, the reasoning is circular. We explain cluster preservation with denominality, but take cluster preservation as a proof for denominality.

• (and it doesn’t work)
Appraisal of Bat El’s arguments

Falacy no. 3: most important

• Bat El claims cluster preservation follows from Melodic Overwriting. But the assignment of the denominal verb to a verb type is not a consequence of Melodic Overwriting.

• The choice whether [stɔim] will go to QiTeL, hiQTiL or QaTaL is dependent on the best preservation of the phonology of the base
Alternative: template imposition

• A more traditional way of deriving denominal verbs simply imposes the right template on the base, and then lets Template Satisfaction do the rest of the work:

\[
\text{hiQTiL} \\
[faks] + \quad \text{or} \\
\text{QiTeL}
\]
Alternative: template imposition

• A more traditional way of deriving denominal verbs simply imposes the right template on the base, and then lets Template Satisfaction do the rest of the work:

\[ \text{hiQTiL} \text{ (will create new clusters)} \]

\[ [\text{faks}] \text{ + or } \text{QiTeL} \]
Alternative: template imposition

• A more traditional way of deriving denominal verbs simply imposes the right template on the base, and then lets Template Satisfaction do the rest of the work:

\[
\begin{align*}
& f \ a \ k \ s \\
& \phantom{f} \text{Q i T e L} \\
\end{align*}
\]

(Cluster Preservation is a principle)
Alternative: template imposition

- A more traditional way of deriving denominal verbs simply imposes the right template on the base, and then lets Template Satisfaction do the rest of the work:

```
f a k s
\|\|\|\|
Q i T e L
(Template Satisfaction through spreading)
```
Alternative: template imposition

Recall the claim that Bat El’s proposal unifies the mechanisms for denominal and deradical verbs; so does Template Imposition, since the same template would be imposed on roots.

The difference will follow from the nature of the base: with only a $<Q,T,L>$ set as a base, there is no base syllabification to adhere to. We predict distribution to be independent of phonology (correct). We also predict the simplest mapping (no clusters etc. – again correct).
Outi Bat El strikes back!!
Outi Bat El strikes back!!

- Bat El later abandoned cluster preservation as an epiphenomenon.

- But continues to ruthlessly defend a rootless view, and acquired quite a following.
The problem of the base

- So if there are no roots, how does one derives a non-denominal verb in Bat El’s system?

- For instance, the verb *sataʁ* ‘contradicted’ has no base noun. The template, which we identified as a morpheme, is clearly QaTaL. What is it conjoined with to get *sataʁ*?
The problem of the base

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- For instance, the verb *sataʁ* ‘contradicted’ has no base noun. The template, which we identified as a morpheme, is clearly QaTaL. What is it conjoined with to get *sataʁ*?

  Bat El’s answer: nothing. The stored form is *sataʁ*. The “root” is a residue.
The problem of the base

- For Bat El, the morphphonological complexity of *sataʁ* is misleading. Since neither QaTaL nor <s,t,ʁ> can mean anything in isolation, it is useless to say that their combination is a derivation.

- But how does one derive, say, the imperfective *jistoʁ*?
The problem of the base

- For Bat El, the morphonological complexity of *sataʁ* is misleading. Since neither QaTaL nor *<s,t,v>* can mean anything in isolation, it is useless to say that their combination is a derivation.

- But how does one derive, say, the imperfective *jistɔʁ*?

Bat El’s answer: your favorite version of Melodic Overwriting.
Summary of the non-root view

<table>
<thead>
<tr>
<th>Nouns</th>
<th>Verbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. kódem</td>
<td>l. kadam</td>
</tr>
<tr>
<td>‘before’</td>
<td>‘precede’</td>
</tr>
<tr>
<td>b. kidum</td>
<td>m. kidem</td>
</tr>
<tr>
<td>‘promotion’</td>
<td>‘promote X’</td>
</tr>
<tr>
<td>c. mikdama</td>
<td>n. hikdim</td>
</tr>
<tr>
<td>‘advance’</td>
<td>‘be/put ahead’</td>
</tr>
<tr>
<td>d. takdim</td>
<td>o. hitkadem</td>
</tr>
<tr>
<td>‘precedence’</td>
<td>‘advance’</td>
</tr>
<tr>
<td>e. kédem</td>
<td></td>
</tr>
<tr>
<td>‘antiquity’</td>
<td></td>
</tr>
<tr>
<td>f. hakdama</td>
<td></td>
</tr>
<tr>
<td>‘prologue’</td>
<td>Adjectives</td>
</tr>
<tr>
<td>g. kadíma</td>
<td>p. kadum</td>
</tr>
<tr>
<td>‘ahead!’</td>
<td>‘ancient’</td>
</tr>
<tr>
<td>h. kidma</td>
<td>q. kadmon</td>
</tr>
<tr>
<td>‘progress (tech.)’</td>
<td>‘prehistoric’</td>
</tr>
<tr>
<td>i. hitkadmut</td>
<td>r. kidm-i</td>
</tr>
<tr>
<td>‘progress (proc.)’</td>
<td>‘frontal’</td>
</tr>
<tr>
<td>j. hekdem</td>
<td>s. makdim</td>
</tr>
<tr>
<td>‘asap’</td>
<td>‘preparatory’</td>
</tr>
<tr>
<td>k. kdam-</td>
<td>t. mukdam</td>
</tr>
<tr>
<td>‘pre-‘</td>
<td>‘early’</td>
</tr>
</tbody>
</table>
Summary of the non-root view

All of these words have to be stored in the lexicon as full words. If the speaker makes any connection between them, it is not as “derived using the same root” but either as derived from one another, or as derived using the same set of consonants, but independently of the meaning, through homophony.
Two arguments in favor of the non-root view

<table>
<thead>
<tr>
<th>past</th>
<th>futur</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ʃipɛb</td>
<td>jefapɛb</td>
<td>'improve'</td>
</tr>
<tr>
<td>kipɛl</td>
<td>jekapɛl</td>
<td>'fold'</td>
</tr>
<tr>
<td>viteb</td>
<td>jевateb</td>
<td>'give up'</td>
</tr>
<tr>
<td>bikef</td>
<td>jevakef</td>
<td>'ask for'</td>
</tr>
</tbody>
</table>
Two arguments in favor of the non-root view

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<th>past</th>
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<th>act.noun</th>
</tr>
</thead>
<tbody>
<tr>
<td>јипе‌в</td>
<td>jeʃape‌в</td>
<td>‘improve’</td>
</tr>
<tr>
<td>кипе‌л</td>
<td>jekapel</td>
<td>‘fold’</td>
</tr>
<tr>
<td>вите‌в</td>
<td>jевате‌в</td>
<td>‘give up’</td>
</tr>
<tr>
<td>бике‌ф</td>
<td>jеваке‌ф</td>
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</tr>
<tr>
<td>kipel</td>
<td>jekapel</td>
<td>‘fold’ kipul</td>
</tr>
<tr>
<td>ʃitev</td>
<td>ʃevatev</td>
<td>‘give up’ vituʃ</td>
</tr>
<tr>
<td>ʃikeʃ</td>
<td>ʃevalkeʃ</td>
<td>‘ask for’ bikuʃ, *vikuʃ</td>
</tr>
</tbody>
</table>

Paradigm Uniformity (PU): a pressure for inflectionally-related forms do be identical in some aspect.
Two arguments in favor of the non-root view

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<tr>
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<th>futur</th>
<th>act. noun</th>
</tr>
</thead>
<tbody>
<tr>
<td>ʃi ре ʃ</td>
<td>ʃeʃa ре ʃ</td>
<td>‘improve’ ʃi ре ʃ</td>
</tr>
<tr>
<td>kи ple</td>
<td>jek a pel</td>
<td>‘fold’ kи ple</td>
</tr>
<tr>
<td>ви te ʃ</td>
<td>jев a te ʃ</td>
<td>‘give up’ ви te ʃ</td>
</tr>
<tr>
<td>ви keʃ</td>
<td>jев a keʃ</td>
<td>‘ask for’ би kuʃ, *ви kuʃ</td>
</tr>
</tbody>
</table>

PU affects the realization of the root. If somehow that had access to the root, we’d expect it to affect other words derived from the root. **But there is never paradigm uniformity of roots.**
Two arguments in favor of the non-root view

<table>
<thead>
<tr>
<th>Words (not CRoots) undergo semantic change (Bat-El 2001)</th>
</tr>
</thead>
<tbody>
<tr>
<td>zarak ‘to throw’</td>
</tr>
<tr>
<td>xazar ‘to return’</td>
</tr>
<tr>
<td>nimlat ‘to escape’</td>
</tr>
<tr>
<td>avad ‘to work’</td>
</tr>
<tr>
<td>kalat ‘to absorb’</td>
</tr>
<tr>
<td>hizrik ‘to throw’</td>
</tr>
<tr>
<td>xizer ‘to turn’</td>
</tr>
<tr>
<td>himlit ‘to help s.o. to escape’</td>
</tr>
<tr>
<td>ibed ‘to process by working’</td>
</tr>
<tr>
<td>hiklit ‘to cause to absorb’</td>
</tr>
</tbody>
</table>

If somehow the root had a Semantic import, change could in principle affect all the forms derived from the same root. **But this never happens.**
Some criticism: Faust & Hever 2010

• If verbal forms are not derived from a root, but from a surface form, one must find that surface form. Modern Hebrew shows that it is impossible to distinguish between all sub paradigms on the basis of a single form.
Some criticism: Faust & Hever 2010

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. *√kr't</td>
<td>karat</td>
<td>kart-</td>
<td>karat-</td>
<td>-krot</td>
<td>-krot</td>
<td>koret</td>
</tr>
<tr>
<td>b. √kri</td>
<td>kara</td>
<td>kart-</td>
<td>kari-</td>
<td>-kre</td>
<td>-krot</td>
<td>kore</td>
</tr>
<tr>
<td>li-krot ‘to happen’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. √kr?</td>
<td>kara</td>
<td>kar?-</td>
<td>kará-</td>
<td>-kra</td>
<td>-kro</td>
<td>kore</td>
</tr>
<tr>
<td>li-kro ‘to read’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. √krA</td>
<td>kara</td>
<td>kar?-</td>
<td>kará-</td>
<td>-kra</td>
<td>-króa</td>
<td>koréa</td>
</tr>
<tr>
<td>li-króa ‘to tear’</td>
<td></td>
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</tbody>
</table>
Some criticism: Faust & Hever 2010

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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. √kr₂krt</td>
<td>karat</td>
<td>krt-</td>
<td>karat-</td>
<td>-krot</td>
<td>-krot</td>
<td>koret</td>
</tr>
<tr>
<td>b. √kri</td>
<td>kara</td>
<td>krt-</td>
<td>kari-</td>
<td>-kre</td>
<td>-krot</td>
<td>kore</td>
</tr>
<tr>
<td>li-krot</td>
<td></td>
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</tr>
<tr>
<td>‘to happen’</td>
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</tr>
<tr>
<td>c. √kr₂</td>
<td>kara</td>
<td>krt-</td>
<td>kara-</td>
<td>-kra</td>
<td>-kro</td>
<td>kore</td>
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<tr>
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<td>‘to read’</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

The paradigm does not have a single entry!
Some criticism: Faust & Hever 2010

- Another criticism from the same paper also involves “weak” roots, this time in Chaha.

  perf.  imperf.  juss.

  a.  täkäs  täkäs  taks  ‘set on fire’
  b.  zäkär  zägär  zägär  ‘jump’
  c.  mäkär  mæxær  mæxær  ‘advise’

=> “Strengthening” in the perfective
Some criticism: Faust & Hever 2010

- Strengthening affects also verbs derived from roots with unrealized radicals.

<table>
<thead>
<tr>
<th></th>
<th>perf.</th>
<th>imperf.</th>
<th>juss.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>√b-r-s</td>
<td>bänäs</td>
<td>βärəs</td>
</tr>
<tr>
<td>b.</td>
<td>√b-r-Ä</td>
<td>bäna</td>
<td>βära</td>
</tr>
<tr>
<td>c.</td>
<td>√b-x-i</td>
<td>bækä</td>
<td>βäxə</td>
</tr>
<tr>
<td>d.</td>
<td>√ä-g-r</td>
<td>akär</td>
<td>agər</td>
</tr>
<tr>
<td>e.</td>
<td>√0-k-s</td>
<td>äkäs</td>
<td>ks</td>
</tr>
<tr>
<td>f.</td>
<td>√d-Ä-r</td>
<td>dar</td>
<td>där</td>
</tr>
<tr>
<td>g.</td>
<td>√x-0-r</td>
<td>xär</td>
<td>xär</td>
</tr>
</tbody>
</table>
Some criticism: Faust & Hever 2010

How can a process based on either the perf. or the juss. identify the second consonant?

<table>
<thead>
<tr>
<th></th>
<th>perf.</th>
<th>imperf.</th>
<th>juss.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>√b-r-s</td>
<td>bänäs</td>
<td>βärəs</td>
</tr>
<tr>
<td>b</td>
<td>√b-r-Ä</td>
<td>bänə</td>
<td>βära</td>
</tr>
<tr>
<td>c</td>
<td>√b-x-i</td>
<td>bänä</td>
<td>βärs</td>
</tr>
<tr>
<td>d</td>
<td>√ä-g-r</td>
<td>akär</td>
<td>agər</td>
</tr>
<tr>
<td>e</td>
<td>√0-k-s</td>
<td>äkäs</td>
<td>ks</td>
</tr>
<tr>
<td>f</td>
<td>√d-ä-r</td>
<td>dar</td>
<td>däär</td>
</tr>
<tr>
<td>g</td>
<td>√x-0-r</td>
<td>xär</td>
<td>xär</td>
</tr>
</tbody>
</table>
Some criticism

• The proponents of the no-root approach have never reacted to the difficulties raised by opposing authors.

• nor have they ever taken on weak roots.

• This is of course no accident. The entire rootless approach becomes extremely inelegant when it comes to account for these.
Some criticism

• Yet weak roots are an integral part of all Semitic languages...

• It may be concluded that besides the shortcomings mentioned, the rootless approach is simply not elaborate enough to evaluate.
Conclusion

• In Semitic languages, items may be grouped around tripartite sets, usually tripartite and consonantal, called “roots.”

• The question was raised late in the 20th century whether this grouping is a cognitive reality or the make-belief of linguists and dictionary-writers.
Conclusion

• Denominal verbs played a central role in the discussion, showing that one needs to take into account more than an extracted root in their case.

• But extending the analysis to regular verbs is a rash move, and is probably wrong. At least paradigms can be said to be derived from a basic discontinuous entity.
Conclusion

• Proponents of the word-based, rootless approach still claim that the root is “too abstract” and is too underspecified (semantically) to justify storage.

• In the next class we’ll see that abstraction is a necessary ingredient of any account of Semitic Morpho-phonology.
Issues in non-concatenative morpho-phonology

OCP, biradicals and correspondence
Introduction: McCarthy 1981

- Greenberg (1978) noted that in Arabic and Hebrew, there are many QTT verbs but almost no QQT ones:

<table>
<thead>
<tr>
<th>Israeli Hebrew</th>
<th>QQT</th>
<th>QQT</th>
</tr>
</thead>
<tbody>
<tr>
<td>gaʁaʁ</td>
<td>‘drag’</td>
<td>*ʁaʁag</td>
</tr>
<tr>
<td>χaʃaʃ</td>
<td>‘dread’</td>
<td>*ʃaʃaχ</td>
</tr>
<tr>
<td>χakak</td>
<td>‘carve’</td>
<td>*kakaʃ</td>
</tr>
</tbody>
</table>
Introduction: McCarthy 1981

- McCarthy sought the reason for this lacuna. First, he assumed that QTT and QQT are not possible representations at the root level:

\[ \text{gamaw} \Rightarrow \sqrt{gmw} \quad \text{but} \quad \text{gaaw} \Rightarrow \sqrt{gw}, \quad \text{a biradical root} \]

(11) **Obligatory Contour Principle** (revised)
A grammar is less highly valued to the extent that it contains representations in which there are adjacent identical elements on any autosegmental tier.
Introduction: McCarthy 1981

• Given
  a root \( \sqrt{g\,\nu} \)
  a left-to-right mapping of root to template
  Template satisfaction (no empty pos.)
  ...one derives only the attested pattern:

\[
\begin{align*}
\text{triradical root} & & \text{biradical root} \\
\sqrt{g \, m \, \nu} & & \sqrt{g \, \nu} \\
C \, a \, C & & C \, a \, C \\
C \, a \, C & & C \, a \, C
\end{align*}
\]
Introduction: McCarthy 1981

• Given
  a root $\sqrt{g\nu}$
  a left-to-right mapping of root to template
Template satisfaction (no empty pos.)
...one derives only the attested pattern:

\[
\begin{array}{c}
\text{triradical root} \\
\sqrt{g\ m\ \nu} \\
/ \quad / \\
C\ a\ C\ a\ C
\end{array}
\quad \begin{array}{c}
\text{biradical root} \\
\sqrt{g\ \nu} \\
/ \quad / \\
C\ a\ C\ a\ C
\end{array}
\]
Introduction: McCarthy 1981

• This is again an “abstract” view of root to template morphology, because it is not WYHIWYG:

• The root might sometimes be not identical to what its surface realization is.
The opposition

• McCarthy’s OCP analysis has become extremely influential, and also raised objections

• From more traditional scholars, such as Gideon Goldenberg, who denied the synchronic validity of biradicals and the OCP

• And from more empiricist linguists like Bat El, who deny the necessity of the root, which they deem too abstract.
Today

• We will start by revising McCarthy’s original proposal to some extent.

• We will then examine Goldengerbg’s objections and Lowenstamm’s 2010 response to them.

• And we will look at Bat El’s 2006 way of doing the OCP, typical of OT’s way of doing Semitic Morphology
Biradicals revisited

• Consider the following triplets from Hebrew:

  a. χanak  χanan  χana
     ‘strangle’  ‘pardon’  ‘park’
  b. kalat  kalal  kala
     ‘recieve’  ‘include’  ‘roast’
  c.jalat  jalal  jala
     ‘reign’  ‘negate’  ‘fish out’

The difference between biradicals and weak-final verbs must be stated lexically.
Biradicals revisited

• Consider the following triplets from Hebrew:

  a. χanak  χanan  χana  νχn
     ‘strangle’ ‘pardon’ ‘park’
  b. kalat  kalal  kala  νkl
     ‘recieve’ ‘include’ ‘roast’
  c. ʃalat  ʃalal  ʃala  νʃl
     ‘reign’ ‘negate’ ‘fish out’

It must be stated somehow that in weak-final roots, the second consonant is not the last one.
Biradicals revisited

• Still, when the last radical is $\emptyset$, what prevents the propagation of the second root $C$?

**weak-final root**

\[ \sqrt[\chi n \emptyset]{} \]

\[ C \ a \ C \ a \ C \]

\[ \frown \]

**biradical root**

\[ \sqrt[\chi n]{} \]

\[ C \ a \ C \ a \ C \]

\[ \smile \]
Biradicals revisited: edge-in association

• Yip (1988) and Buckley (1990) propose that templates are satisfied from the edge in. Spreading is only ever leftwards:

weak-final root
\[ \sqrt{\chi} \text{ n } \phi \]
\[ \text{C a C a C} \]

biradical root
\[ \sqrt{\chi} \text{ n} \]
\[ \text{C a C a C} \]
Biradicals revisited: edge-in association

- More evidence, from Tigrinya (Buckley 1990):

<table>
<thead>
<tr>
<th>(1)</th>
<th>root</th>
<th>singular</th>
<th>plural</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>{knfr}</td>
<td>kanfar</td>
<td>kanafir</td>
<td>‘lip’</td>
</tr>
<tr>
<td></td>
<td>{mndl}</td>
<td>mandal</td>
<td>manadil</td>
<td>‘chisel’</td>
</tr>
<tr>
<td></td>
<td>{klšm}</td>
<td>kilšim</td>
<td>kalašim</td>
<td>‘arm’</td>
</tr>
</tbody>
</table>

(3) Anchoring

```
C ∧ C a C ĩ C
|     |     |     |     |
| k   | n   | f   | r   |
```
Biradicals revisited: edge-in association

• More evidence, from Tigrinya (Buckley 1990):

(1)  

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<td>mandal</td>
<td>manadil</td>
<td>‘chisel’</td>
</tr>
<tr>
<td>{klsm}</td>
<td>kilśim</td>
<td>kalasim</td>
<td>‘arm’</td>
</tr>
</tbody>
</table>

(2)  

| {tmn}   | taman    | tamamin   | ‘snake’ |
| {grb}   | garab    | gararib   | ‘bush’  |

(3)  

<table>
<thead>
<tr>
<th>Anchoring</th>
<th>Filling</th>
</tr>
</thead>
<tbody>
<tr>
<td>C V C V C V C</td>
<td>C V C V C V C</td>
</tr>
<tr>
<td>t m n</td>
<td>t m n</td>
</tr>
</tbody>
</table>
Goldenberg (1994) vs. Biradicals

• An expert of Semitic Languages, Gideon Goldenberg (1930-2013) criticized McCarthy for three things:

  1) Representation: “little more that a modest contribution to the graphic arts”
  2) The OCP: “many counter-examples in Ethio-Semitic”
  3) Biradicality: “etymon, not root”
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  3) Biradicality: “etymon, not root”

  Syllabicity may change within inflection (IH yixtevu ‘they will write’ but ya’avdu ‘they will work’; Paelstinian yikteb ‘that he write’, yikitbu ‘that they write’).
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3) Biradicality: “etymon, not root”

Not active synchronically, e.g. *bear* – *born* in English. What is active synchronically are **triradical** roots in which $R_2=R_3$. 
Lowenstamm (2010) for Biradicals

• Lowenstamm’s nicest counter arguments come from Ethio-Semitic Chaha.

Chaha floating palatalisation (McCarthy 1983)

<table>
<thead>
<tr>
<th>2nd msg imperative</th>
<th>2nd fms imperative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a. dɨmd</strong></td>
<td>dɨmd(^y) ‘assemble’</td>
</tr>
<tr>
<td><strong>b. nɨgɨf</strong></td>
<td>nɨg(^y)ɨf ‘fall’</td>
</tr>
<tr>
<td><strong>c. dɨgɨs</strong></td>
<td>dɨgɨs(^y), *dɨg(^y)ɨs(^y) ‘entertain’</td>
</tr>
<tr>
<td><strong>d. sɨrəf</strong></td>
<td>sɨrəf, *s(^y)rəf ‘fear’</td>
</tr>
</tbody>
</table>

Palatalization anchors onto rightmost palatalizable C, goes only as far as the penultimate R.
Lowenstamm (2010) for Biradicals

Chaha floating palatalisation (McCarthy 1983)

<table>
<thead>
<tr>
<th>2\textsuperscript{nd} msg imperative</th>
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</tr>
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<tbody>
<tr>
<td>a. dɨmd</td>
<td>dɨmd\textsuperscript{y}</td>
</tr>
<tr>
<td>b. nɨgɨf</td>
<td>nɨg\textsuperscript{y}if</td>
</tr>
<tr>
<td>c. dɨgɨs</td>
<td>dɨgɨs\textsuperscript{y}, *dɨg\textsuperscript{y}is\textsuperscript{y}</td>
</tr>
<tr>
<td>d. sɨrəf</td>
<td>sɨrəf, *sɨrəf</td>
</tr>
<tr>
<td>e. sɨdɨd</td>
<td>sɨd\textsuperscript{y}id\textsuperscript{y}</td>
</tr>
<tr>
<td>f. nɨzɨz</td>
<td>nɨz\textsuperscript{y}iz\textsuperscript{y}</td>
</tr>
<tr>
<td>g. kʔɨfɨf</td>
<td>kʔ\textsuperscript{y}ifɨf</td>
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2^{nd} msg imperative 2^{nd} fms imperative

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d. sɨrəf sɨrəf, *s\(^y\)rəf ‘fear’
e. sɨdɨd sɨd\(^y\)ɨd\(^y\) ‘drive cattle’
f. nɨzɨz nɨz\(^y\)ɨz\(^y\) ‘dream’
g. kʔɨfɨf kʔ\(^y\)ɨfɨf ‘clip’

How come palatalization does stop at the last consonant in (a,c) and gets to the first one in (g)?
Lowenstamm (2010) for Biradicals

The distribution actually follows from the biradical analysis!

\[ \sqrt{s} \quad d + y \]
\[ \sqrt{k} \quad f + y \]

\[ [s\text{d}y\text{d}y] \]
\[ [k\text{y}i\text{f}i\text{f}] \]

If these roots were \( \sqrt{sdd} \) and \( \sqrt{kff} \), there would be no reasons for this distribution of the palatal melody.
Lowenstamm (2010) for Biradicals

• Goldenberg’s 2\textsuperscript{nd} argument was the mere existence of QQT verbs in Ethiopic. Lowenstamm examines their distribution in Chaha..

Chaha verbal system

<table>
<thead>
<tr>
<th>Type</th>
<th>perfective</th>
<th>Jussive</th>
<th>Jussive vocalization</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>A\textsubscript{1}</td>
<td>\textit{kətəfa}</td>
<td>\textit{yəkətəf}</td>
<td>&lt;i, i&gt;</td>
<td>‘chop meat’</td>
</tr>
<tr>
<td>A\textsubscript{2}</td>
<td>\textit{sənəxə}</td>
<td>\textit{yəsənəx}</td>
<td>&lt;i, o&gt;</td>
<td>‘be impure’</td>
</tr>
<tr>
<td>B</td>
<td>\textit{q\textsuperscript{w}əmərə}</td>
<td>\textit{yəq\textsuperscript{w}əmər}</td>
<td>&lt;ə, i&gt;</td>
<td>‘become strong’</td>
</tr>
<tr>
<td></td>
<td>\textit{sirəpətə}</td>
<td>\textit{yəsəmbiıt}</td>
<td>&lt;ə, i&gt;</td>
<td>‘take a sabbatical’</td>
</tr>
<tr>
<td>C</td>
<td>\textit{č\textsuperscript{w}ərə}</td>
<td>\textit{yəč\textsuperscript{w}ər}</td>
<td>&lt;ə, i&gt;</td>
<td>‘scratch’</td>
</tr>
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Lowenstamm (2010) for Biradicals

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<td>\textit{yəgīmīm}</td>
<td>&lt;ī,i&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A\textsubscript{2}</td>
<td>QTT</td>
<td>\textit{yəfīzəz}</td>
<td>&lt;ī,a&gt;</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>\textit{yəm\textsuperscript{w}atīt}</td>
<td>&lt;ə,i&gt;</td>
</tr>
<tr>
<td></td>
<td>QTT</td>
<td>\textit{yəkəkər}</td>
<td>&lt;ə,i&gt;</td>
</tr>
<tr>
<td>C</td>
<td>QTT</td>
<td>\textit{yəbəzəz}</td>
<td>&lt;a,i&gt;</td>
</tr>
<tr>
<td></td>
<td>QTT</td>
<td>\textit{yəq\textsuperscript{w}aq\textsuperscript{w}is}</td>
<td>&lt;a,i&gt;</td>
</tr>
</tbody>
</table>
Lowenstamm (2010) for Biradicals

- Quadriradicals also never appear in Type A. Banksira (2000) makes the analogy: these QQT roots are quadriradicals.

QQT are the result of fully reduplicated, clipped biradicals.

\[
\begin{align*}
&a. \text{clipping} & b. \text{no reanalysis} & c. \text{reanalysis} \\
&\sqrt{\text{k}\text{r}\text{k}\text{r}} & \sqrt{\text{k}\text{k}\text{r}} & \sqrt{\text{k}\text{k}\text{r}} \\
&\text{y\check{a}C\check{e}C\check{e}C\check{C}iC} & \text{y\check{a}C\check{e}C\check{e}C\check{C}iC} & \text{y\check{a}C\check{e}C\check{e}C\check{C}iC}
\end{align*}
\]

Note that otherwise, their absence from type A is completely mysterious.
Lowenstamm (2010) for Biradicals

- Quadriradicals also never appear in Type A. Banksira (2000) makes the analogy: these QQT roots are quadriradicals.

QQT are the result of fully reduplicated, clipped biradicals

\[
\begin{align*}
\text{a. clipping} & & \text{b. no reanalysis} & & \text{c. reanalysis} \\
\vee k r k r & & \vee k k r & & \vee k r \\
\mid \not\mid \not\mid \not\mid & & \mid \mid \mid & & \not\mid \not\mid \not\mid \\
yo C \vee C C \dd C & & yo C \not\vee C \dd C & & yo C \not\vee C \dd C
\end{align*}
\]

Still, (b) is a \textbf{derived} violation of the OCP. We have to show that the correct representation is (c).
The first radical is palatalized; if this can’t be, the second is. But never both.
Lowenstamm (2010) for Biradicals

Chaha floating Paltalization as a marker of Type B

<table>
<thead>
<tr>
<th>Imperfective</th>
<th>Jussive</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.  yiṣ'ək'it</td>
<td>yəsək'it, *yəs'yək'it</td>
<td>‘fix’</td>
</tr>
<tr>
<td>b.  yımək'yor</td>
<td>yəmək'ir, yəsək'yır</td>
<td>‘burn’</td>
</tr>
<tr>
<td>c.  *yiṣ'yək'yırt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.  yiḵ'ək'yırt</td>
<td>yəkək'ir</td>
<td>‘be hugged (3rd ms)’</td>
</tr>
</tbody>
</table>
Lowenstamm (2010) for Biradicals

Chaha floating Paltalization as a marker of Type B

imperfective

a. ɣǐs'yəkǐt
b. ɣımk'yīr
c. ɣyis'yək'yīt

Jussive

yəsəkǐt, ɣyəs'yəkǐt
yəməḳər, yəsək'yīr

‘fix’
‘burn’

yəkəḳər

‘be hugged (3rd ms)’

Only the analysis in (c), which does not involve an OCP violation, works
Interim summary

• biradical roots are alive and well: roots of the type QTT are never primitive, always reduceable to bipartite sets QT.

• All cases of QQT have a story about them. In Ethio-Semitic, they are clipped reduplicated biradicals. As we return to Bat El’s take on biradical’s, we’ll see another such story
Bat EL (2006): reduplication without biradicals?

- Bat El claims that roots do not play any role in Semitic Morphology. The basic unit for her is the **stem**.

- In order to account for the effects we have seen, Bat El needs to show why, for speakers, a stem like QiTeT behaves as if it were derived from a smaller unit QT.
Bat El (2006): reduplication without biradicals?

• Bat El fully endorses the OCP

(11) *Obligatory Contour Principle* (revised)
A grammar is less highly valued to the extent that it contains representations in which there are adjacent identical elements on any autosegmental tier.

• This means, that given two adjacent segments, speakers will want to assume that they are one:

\[
\text{Speaker hears} \quad \chi_{itet} \quad \text{speaker understands} \quad \chi_1 it_2 et_2 \quad \text{rather than} \quad \chi_1 it_2 et_3
\]
Bat EL (2006): reduplication without biradicals?

- Following Correspondence Theory Bat El proposes the following constraints:

**Surface Correspondence by Identity (SCorrI)**

If $S$ is a stem, 
$C_x$ & $C_y$ $\in$ S, and 
$C_x$ & $C_y$ are identical, 
Then $C_x$ & $C_y$ are correspondents.
Bat EL (2006): reduplication without biradicals?

- Following Correspondence Theory Bat El proposes the following constraints:

\[
\textit{Surface Correspondence by Position (SCorrP)}
\]

If $S$ is a stem,

- $C_x \& C_y \in S$,
- $C_x \& C_y$ are identical, and
- $C_x \& C_y$ are at the right edges of the domains,

Then $C_x \& C_y$ are correspondents.
Bat EL (2006): reduplication without biradicals?

• For a stem to be perceived as having been achieved by reduplication, its domain edges must be wider than those of its base:

a. The domain structure of a reduplicated stem: \([\{\ldots\}\text{Base} \cdot \cdot \cdot ]\text{Stem}\)
b. The domain structure of a nonreduplicated stem: \([\{\ldots\}\text{Base}\}\text{Stem}\)
Bat EL (2006): reduplication without biradicals?

<table>
<thead>
<tr>
<th>kided</th>
<th>SCORRIP</th>
<th>SCORRI</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image.png" alt="Image" /></td>
<td><img src="image.png" alt="Image" /></td>
<td><img src="image.png" alt="Image" /></td>
</tr>
<tr>
<td>a. <img src="image.png" alt="Image" /></td>
<td><img src="image.png" alt="Image" /></td>
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<tr>
<td>b. <img src="image.png" alt="Image" /></td>
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</tr>
<tr>
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</table>

right edge of the base

right edge of the stem
Bat EL (2006): reduplication without biradicals?

<table>
<thead>
<tr>
<th>kided</th>
<th>S\text{CORRP}</th>
<th>S\text{CORRI}</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. $\mathfrak{C} {k_1id_2ed_2c}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ${k_1id_2ced_2}$</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. ${k_1id_2ed_3}$</td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

Bat El thus endorses the view that the second of the two identical C’s is the copy, a view analogous to left-to-right, rather than edge-in association.
The analysis derives the existence of a base that is smaller than the stem in these cases, without the need to assume a root.
Bat EL (2006): reduplication without biradicals?

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>a. ${k_{i1}d_{2}}ed_{2c}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ${k_{i1}d_{2c}e_{d_{2}}}$</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. ${k_{i1}d_{2}e_{d_{3}}}$</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

But in practice, there is very little difference: Bat El says that for any stem QvTvT, there is a base which includes $<Q,T>$. Why not call it by its name?
QQT in Israeli Hebrew

- Israeli Hebrew, like Ethio-Semitic, has a handful of violations of the OCP. They are:
  
  - mimen ‘fund’
  - mimeʃ ‘realize’
  - gigel ‘google’
  - dida ‘limp’
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Because there are only four such verbs, it is tempting to write them off as exceptions. But the grammar should allow for them...
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mimen ‘fund’ <= mamon ‘capital’
mimeʃ ‘realize’ <= mamaʃ ‘real(ly)’
gigel ‘google’ <= gúgel ‘google’
dida ‘limp’ <= onomathopea

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Recall our principle of faithfulness to the base in denominal verbs: one may simply say that here the synchronic existence of a base allows the violation of the OCP.
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But what if the base falls out of use, or becomes extremely rare (actually, *mamon* is already a lot rarer than *mimen*…)?

Recall our principle of faithfulness to the base in denominal verbs: one may simply say that here the synchronic existence of a base allows the violation of the OCP.
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<th>SCORRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ([m_1c {m_1e}_2})</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b. ([{m_1im_1c}_2])</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. ([{m_1im_2e}_3})</td>
<td></td>
<td>*</td>
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not at the edge of any domain
QQT in Israeli Hebrew

<table>
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<td>a. $[m_1Ci{m_1en_2}]$</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b. $[{m_1im_1Cen_2}]$</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. ${m_1im_2en_3}$</td>
<td></td>
<td>*</td>
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not the right edge of the stem

not the right edge of the base
QQT in Israeli Hebrew

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<th>SCorrI</th>
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<td>c. ({m_1im_2en_3})}</td>
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Bat EL (2006): reduplication without biradicals?

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Then $C_x$ & $C_y$ are correspondents.
Bat EL (2006): reduplication without biradicals?

Why not have a similar constraint for the left edge?! In that case, *mimen* would be the preferred throughout Semitic, and we wouldn’t find any *kided*. But all Semitic languages behave identically in this respect.

\[ C_x \cap C_y \subseteq S, \]
\[ C_x \cap C_y \text{ are identical, and} \]
\[ C_x \cap C_y \text{ are at the right edges of the domains,} \]

Then \[ C_x \cap C_y \text{ are correspondents.} \]
Bat EL (2006): reduplication without biradicals?

- Bat El’s response (p.c.) is that this is a difference between Templatic reduplication (reduplication driven by Template Satisfaction), and extra-templatic reduplication, e.g.

**Israeli Hebrew**

- tipa ‘drop/ a bit’
- géver ‘man’
- tip-tipa ‘a little bit’
- gev-gever ‘a man’
Bat EL (2006): reduplication without biradicals?

- Templatic Reduplication maintains the base on the left, whereas extra-templatic reduplication tends to prefix the reduplicated part.

**Israeli Hebrew**

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Bat EL (2006): reduplication without biradicals?

• Templatic Reduplication maintains the base on the left, whereas extra-templatic reduplication tends to prefix the reduplicated part.

Edge-in association derives exactly that. But Bat El seems to endorse rightwards spreading:

\[
\{k_1id_2\}ed_{2C}
\]
Bat EL (2006): reduplication without biradicals?

- Regardless of that, in OT the main issue is not the constraints used, but the prediction for typology: any ranking of the constraints will in principle yield a possible language. But consider what will happen if SCOrrP and SCOrrI were inverted:

<table>
<thead>
<tr>
<th>mimen</th>
<th>SCOrrI</th>
<th>SCOrrP</th>
</tr>
</thead>
<tbody>
<tr>
<td>$[m_{1}cim_{1}e_{n_{2}}]$</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>$[m_{1}im_{1}c_{n_{2}}]$</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>$[m_{1}im_{2}e_{n_{3}}]$</td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>
Bat EL (2006): reduplication without biradicals?

Bat El has to say that her ranking is universal. This is another problem, if only because, as we have seen, non-templatic reduplication tends to be prefixal.

<table>
<thead>
<tr>
<th>mimen</th>
<th>SCorriI</th>
<th>SCorrP</th>
</tr>
</thead>
<tbody>
<tr>
<td>[m₁Ci{m₁en₂}]</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>[{m₁im₁Cen₂}]</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>[{m₁im₂en₃}]</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>
summary

- Roots with two consonants seem to support the root-and-templat hypothesis. They fly in the face of claims as to the undesirable abstractness of the root.

- McCarthy (1981) claimed that these roots illustrate a universal (cognitive) tendency against assuming multiple origins for adjacent identical specimens.

- His argument relied crucially on the root level – on the surface the consonants are usually separated.
summary

• McCarthy’s analysis involved left-to-right mapping, which might need to be revised into edge-in mapping; but it remains a very solid and influential analysis.

• Goldenberg attempted to ridiculeize the achievement of autosegmental representations and the OCP.

• But Lowenstamm showed that biradicals and the OCP are alive and well in exactly the same languages that Goldenberg claimed pose a problem for this view.
Summary

• Bat El, working in a root-less approach, attempted to derive the obvious correspondence between the two identical surface consonants without assuming an « abstract » root.

• But in the end, she must appeal to a “base” that is smaller than the stem and comprises of only the first two consonants. How different is this view from one that accepts a level of representation with a biradical root?
Anticipation

• The same tendencies will be apparent in the next lecture, when we examine another contested notion of Semitic –

The template
Issues in non-concatenative morpho-phonology

The template
Template

- « A fixed syllabic space »
- Must be satisfied/filled (triggers redup.)

McCarthy: $\forall \ k \ t \ b$

$C \ a \ C \ C \ a \ C$
Template

- « A fixed syllabic space »
- Must be satisfied/filled (triggers redup.)

McCarthy:

\[
\begin{align*}
V & \quad k \quad t \quad b \\
C & \quad a \quad C \\
C & \quad C \\
C & \quad a \\
C & \quad C
\end{align*}
\]

The template is composed of Cs and Vs
Today

• Problems with this initial representation

• The CVCV solution of Lowenstamm (1996)

• The challenge of IH ‘ibstvekt ‘make abstract’ and the non-skeletal templates of OT

• The challenge of reduplication and the proposal in Faust (2015).
Problematizing the template

<table>
<thead>
<tr>
<th></th>
<th>sg</th>
<th>pl</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Palestinian</strong></td>
<td>jīktīb</td>
<td>jīktību</td>
</tr>
<tr>
<td></td>
<td>jūt‘ilūb</td>
<td>jūt‘ilūbu</td>
</tr>
<tr>
<td></td>
<td>jīftāḥ</td>
<td>jīftāḥu</td>
</tr>
<tr>
<td><strong>Israeli Hebrew</strong></td>
<td>jāχʃov</td>
<td>jāχʃevu</td>
</tr>
<tr>
<td></td>
<td>jāʔavod</td>
<td>jāʔavdu</td>
</tr>
</tbody>
</table>

Goldenberg’s objection: if templates were Cs and Vs then the alternating cases have to have different templates – not likely!
Problematizing the template

Goldenberg’s objection: if templates were Cs and Vs then the alternating cases have to have different templates – not likely!
Problematizing the template

Goldenberg’s objection: if templates were Cs and Vs then the alternating cases have to have different templates – not likely!
Lowenstamm (1996): CV as the only « syllable »

- There is only one unit in the skeletal tier: a CV unit.

\[\text{[χaʃav]} \quad \text{‘he thought’}\]

\[
\begin{array}{c}
  \chi \\
  \mid \\
  \mid \\
  \mid \\
  \text{C V C V C V}
\end{array}
\]

a
Lowenstamm (1996): CV as the only « syllable »

- There is only one unit in the skeletal tier: a CV unit.

\[ [\chi aʃav] \quad \text{‘he thought’} \]

\[ \begin{array}{ccc}
\chi & \int & V \\
| & | & |
\end{array} \quad C \quad V \quad C \quad V \quad C \quad V \\
\quad | \\
a \quad \text{Final Empty Nucleus (FEN) allowed as a parameter (common to CVCV and Government Phonology, Kaye et al. 1985, 1990)} \]
Lowenstamm (1996): CV as the only « syllable »

- Unassociated Vs are silenced by **Governement**

\[ \text{[jaχ[ov]} \quad \text{‘he’ll think’} \]

\[
\begin{array}{cccccccc}
\text{C} & \text{V} & \text{C} & \text{V} & \text{C} & \text{V} & \text{C} & \text{V} \\
\end{array}
\]
Lowenstamm (1996): CV as the only « syllable »

Recall \( \text{jax} \text{fo} \text{v} \)  \( \text{jax} \text{fe} \text{vu} \) ‘think’

compare to \( \text{jits} \text{sov} \)  \( \text{jits} \text{ku} \) ‘createèè

\[ \Rightarrow \text{The /o/ is absent from the plural} \]
Lowenstamm (1996): CV as the only « syllable »

Recall $\text{jæ\text{\textch}}\text{\textov}$  $\text{jæ\text{\textch}evu}$ ‘think’

compare to $\text{jíʦ\text{\textso\textv}}$  $\text{jíʦ\text{\textsb\textu}}$ ‘createè’

$\Rightarrow$ The /o/ is absent from the plural

Position has a job to do, realized

Position out of a job, governed, unrealized
Lowenstamm (1996): CV as the only « syllable »

Recall

\[ \text{ja\text{x}evu} \quad \text{ja\text{x}o\text{v}} \quad \text{‘think’} \]
\[ \text{ja\text{v}evu} \quad \text{ja\text{v}o\text{v}} \quad \text{‘work’} \]

\[ \Rightarrow \text{The /o/ is absent from the plural} \]
Lowenstamm (1996): CV as the only « syllable »

Recall

\[ jαχ\text{Io}v \quad jαχ\text{Je}v\text{u} \quad \text{‘think’} \]
\[ jα\text{ʔa}v\text{o}v \quad jα\text{ʔa}v\text{Bu} \quad \text{‘work’} \]

=> The /o/ is absent from the plural

\[ j \quad a \quad ? \quad a \quad v \quad \text{Bu} \quad \text{V3 “out of a job”, governed, silenced} \]
\[ \text{C} \quad \text{V} \quad \text{C} \quad \text{V}_2 \quad \text{C} \quad \text{V}_3 \quad \text{C} \quad \text{V} \]
Lowenstamm (1996): CV as the only « syllable »

Palestinian 

\[ \text{ jitib } \quad \text{ jikitbu } \quad \text{ ‘write’} \]
\[ \text{ jutlib } \quad \text{ jutlibu } \quad \text{ ‘ask’} \]

=> vowel is not exclusive to alternating position, floating
Lowenstamm (1996): CV as the only « syllable »

Palestinian  jǐktīb  jǐkītbu  ‘write’
            jūtʕlāb  jūtʕlābu  ‘ask’

=> vowel is not exclusive to alternating position, floating

V₃ empty and ungoverned, attracts melody.
Lowenstamm (1996): CV as the only « syllable »

Palestinian

\[ \text{jɪktɪb} \quad \text{jɪktɪbu} \quad \text{‘write’} \]
\[ \text{jʊtʻlɪb} \quad \text{jʊtʻlɪbu} \quad \text{‘ask’} \]

\[ \rightarrow \text{vowel is not exclusive to alternating position, floating} \]

\[ \text{j} \quad \text{k} \quad \text{t} \quad \text{b} \]
\[ \text{C} \quad \text{V} \quad \text{C} \quad \text{V}_2 \quad \text{C} \quad \text{V}_3 \quad \text{C} \quad \text{V} \]

\[ \text{I} \]

\[ \text{V}_3 \text{ empty and ungoverned, attracts melody.} \]
Lowenstamm (1996): CV as the only « syllable »

Palestinian

\[ \text{jiktib} \quad \text{jiktibu} \quad \text{‘write’} \]
\[ \text{jult'lob} \quad \text{jult'lobu} \quad \text{‘ask’} \]

=> vowel is not exclusive to alternating position, floating

\[ \begin{array}{ccccccc}
  & j & k & t & b & u & \\
  | & | & | & | & | & | \\
 C & V & C & V_2 & C & V_3 & C & V \\
  | & | & | & | & | & | & | \\
 I \\
\end{array} \]

\[ V_3 \text{ empty and governed, } V_2 \text{ becomes ungoverned, attracts melody.} \]
Lowenstamm (1996): CV as the only « syllable »

<table>
<thead>
<tr>
<th>Palestinian</th>
<th>jǐktīb</th>
<th>jǐkītbu</th>
<th>‘write’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>jīftaḥu</td>
<td>jiftaḥu</td>
<td>‘open’</td>
</tr>
</tbody>
</table>

=> vowel is exclusive to position, does not float
Lowenstamm (1996): CV as the only « syllable »

Palestinian:  
\[ jɪktɪb, jɪktɪbu \]  ‘write’  
\[ jɪftaḥ, jiftaḥu \]  ‘open’

=> vowel is exclusive to position, does not float

\[ j \ f \ t \ ū \]
\[ C \ V \ C \ V_{2} \ C \ V_{3} \ C \ V \]

\[ w \]
\[ I \ a \]

\[ V_{3} \] not empty, governs \[ V_{2} \]  
other melody not needed.
Lowenstamm (1996): CV as the only « syllable »

Palestinian

$jɪktɪb$  $jɪkɪtbu$  ‘write’

$jɪftaḥ$  $jiftaḥu$  ‘open’

=> vowel is exclusive to position, does not float

Same configuration, nothing changes.
Interim Summary

• The CVCV approach to templates lives up to Goldenberg’s challenge based on principles independently necessary elsewhere.

• By restricting the skeletal unit to one type, the CV unit, alternations in syllabification are not longer viewed as using different templates.
Back to denominal verbs in IH

• Both the CVCV approach and the templates of McCarthy predetermine the number of consonants in the stem.

• This was not carried over into later work in OT. In accordance with the general dismissal of representations, accounts such as Ussishkin (2000) reduce the template to its vowels.
“Root-and-template morphology without roots and templates”

IH

Ussishkin (2000)

gadal ‘grow (intr)’ => gidel ‘grow (trns)’

<table>
<thead>
<tr>
<th></th>
<th>FtBIN</th>
<th>OO-MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii) gadal+i e</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. [gi][dela]</td>
<td>*!</td>
<td>*</td>
</tr>
<tr>
<td>b. [gadile]</td>
<td>*!</td>
<td>*</td>
</tr>
<tr>
<td>c. [gidel]</td>
<td></td>
<td>**</td>
</tr>
</tbody>
</table>

Assuming priority for the realization of affix vowel over those of the base...
IH

`gadal ‘grow (intr)’ => gidel ‘grow (trns)’`

<table>
<thead>
<tr>
<th></th>
<th>WORDMIN</th>
<th>VP4{ie}</th>
<th>IDENTV</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>gadal</td>
<td></td>
<td>*!</td>
</tr>
<tr>
<td>b.</td>
<td>igadale</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>gidel</td>
<td></td>
<td>**</td>
</tr>
</tbody>
</table>

Morpheme realization constraint
A major advantage of the vowel-only view of templates is denominal verbs.

a. [ʔábstɔːkt] => [le-ʔabstɔːkɛt] ‘make abstract’
b. [hípster] => [le-hit-hapstɛʁ] ‘go hipster’
c. [ʔíndeks] => [le-ʔandɛks] ‘index’
d. [stʁiptíz] => [le-stʁaptɛz] ‘strip-tease’
e. [stʁíming] => [le-ha-stʁím] ‘stream’
f. [χantaʁíʃ] => [le-χantvɛʃ] ‘talk nonsense’
Denominals

- Given  
  1. [ʔabstʁakt]
  2. the melody <i,e>,

  it is easy to derive [ʔibstʁekt], whether by Melodic Overwriting or as in the previous slides.
Denominals

- But given [ʔabstʁakt],
a melody <i,e>
and a CVCVCVCV skeleton
  (the maximal domain for
  native verbs)

all other things being equal, we expect the
derivation to crash – there is simply not enough
room for all the consonants.

=> this prediction, we saw, is wrong.
There might be a way out. Within CVCV and GP, some sequences of consonants are considered as a closed domain.
Denominals

- There might be a way out. Within CVCV and GP, some sequences of consonants are considered as a **closed domain**.

\[
\begin{align*}
\text{a. } & \text{br} & \varepsilon & \text{d} \\
\text{c. } & \text{C} & \text{V} & \text{C} & \text{V}
\end{align*}
\]

\[
\begin{align*}
\text{b. } & \text{b} & \varepsilon & \text{d} & \varepsilon & \text{d} \\
\text{c. } & \text{[C} & \text{V} & \text{C]} & \text{V} & \text{C} & \text{V}
\end{align*}
\]

[s]-initial clusters and final clusters can be viewed on a par, as domains.
Denominals

- If so, it can be proposed that every C in the template can be expanded insofar as it remains a single domain
Denominals

- Although this weakens somewhat the autosegmental analysis, it does make an interesting prediction:

Since internal codas allow only for one consonant, denominals which yield biconsonantal internal codas should crash
Denominals

- Such scenarios have to be invented, which can serve as confirmation for the proposal.
- Consider [ʔintegral]. Outside CVCV, the verb should be [ʔintgrel], because [nt] is a legitimate word-final coda cluster in IH, and [gr] is a legitimate onset cluster.

```
[ʔ] i[nt] e[gr] a [l]
```

```
C i C C e C
```
Denominals

- Such scenarios have to be invented, which can serve as confirmation for the proposal.
- Consider [ʔintegral]. Outside CVCV, the verb should be [ʔintgrel], because [nt] is a legitimate word-final coda cluster in IH, and [gr] is a legitimate onset cluster.

But this verb is not acceptable, because [nt] is not a possible domain word-internally.
Another point in favor of a theory with real templates, rather than only the vowels, comes from biradicals and weak verbs. Recall IH:

a. χanak  χanan  [vχn]  χana  [vχnø]
   ‘strangle’ ‘pardon’ ‘park’

b. kalat  kalal  [vkl]  kala  [vklø]
   ‘receive’ ‘include’ ‘roast’
Biradicals and weak verbs

- Another point in favor of a theory with real templates, rather than only the vowels, comes from biradicals and weak verbs. Recall IH:

a. χanak  χanan  χana  
  ‘strangle’  ‘pardon’  ‘park’

b. kalat  kalal  kala  
  ‘recieve’  ‘include’  ‘roast’

If the template here were only <a,a> what would motivate reduplication in biradicals but not in weak-final?
Evidence from Tashlhiyt Berber

The template $uQTiL$ derives As andNs from verbs (Dell & Elmdlaoui 1992):

<table>
<thead>
<tr>
<th>base</th>
<th>$uQTiL$</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>krs</td>
<td>ukris</td>
<td>‘tie in a bundle/trousseau’</td>
</tr>
<tr>
<td>lmmus</td>
<td>ulmis</td>
<td>‘be bland/something bland’</td>
</tr>
<tr>
<td>mllul</td>
<td>ulmlil</td>
<td>‘be white/white’</td>
</tr>
<tr>
<td>yzzif</td>
<td>uyzif</td>
<td>‘be long/long’</td>
</tr>
<tr>
<td>kk$^W$im</td>
<td>ukkim</td>
<td>‘to strike/a blow’</td>
</tr>
<tr>
<td>!gzz</td>
<td>!ugziz</td>
<td>‘to cruch/mouthful’</td>
</tr>
</tbody>
</table>
Evidence from Tashlhiyt Berber

D&E show that there are only three positions in the template: if geminates from the base can be transferred, they are, but sometimes they can't be.

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This cannot be due to the imposibility of forms with transfered geminates, since Tashlhiyt has no problem with words like *ulmmis* etc.

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</tbody>
</table>

The template cannot be reduced to its vowels; one has to specify positions that must harbor one and only one consonant.
### Evidence from Qaraqosh Neo-Aramaic

Khan (2002)

<table>
<thead>
<tr>
<th>Type</th>
<th>Past stem</th>
<th>Present stem</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>qlib</td>
<td>qalәb</td>
<td>‘turn over’</td>
</tr>
<tr>
<td>II</td>
<td>muqlib</td>
<td>maqlәb</td>
<td>‘cause to turn over’</td>
</tr>
<tr>
<td>III</td>
<td>mqudim</td>
<td>mqadәm</td>
<td>‘present, propose’</td>
</tr>
</tbody>
</table>

- The present stem of all three types has the same vocalization.
- but its appearance after the \( m \) or after \( R_1 \) is unpredictable through the application of the melody alone.
Evidence from Qaraqosh Neo-Aramaic

Khan (2002)

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</tr>
</tbody>
</table>

(Note in addition that types II is nearly always the causative of type I. Yet it is the unrelated type III that has the same syllabic structure as type I)
Interim Summary II

• Although in some data sets from some languages, representing the template as a simple vowel set is sufficient, in other cases it is crucially insufficient.

• The template, as in lexically and arbitrarily C and V positions, is an indispensable tool in the analysis of non-concatenative phenomena.
The challenge of reduplication

Consider again the data from reduplication in IH:

<table>
<thead>
<tr>
<th></th>
<th>Type I</th>
<th></th>
<th>Type II</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>šamar</td>
<td>‘to keep’</td>
<td>šimer</td>
<td>‘to preserve’</td>
</tr>
<tr>
<td></td>
<td>gadal</td>
<td>‘to grow’</td>
<td>gidel</td>
<td>‘to cultivate’</td>
</tr>
<tr>
<td></td>
<td>xašav</td>
<td>‘to think’</td>
<td>xišev</td>
<td>‘to calculate’</td>
</tr>
<tr>
<td>b.</td>
<td>laxaš</td>
<td>‘to whisper’</td>
<td>lixšėš</td>
<td>‘to whisper repeatedly’</td>
</tr>
<tr>
<td></td>
<td>caxak</td>
<td>‘to laugh’</td>
<td>cixkek</td>
<td>‘to giggle’</td>
</tr>
<tr>
<td></td>
<td>(š)akac</td>
<td>‘to sting’</td>
<td>(š)ikceć</td>
<td>‘to sting lightly in many places’</td>
</tr>
</tbody>
</table>
The challenge of reduplication

Consider again the data from reduplication in IH:

<table>
<thead>
<tr>
<th></th>
<th>Type I</th>
<th>Type II</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>šamar ‘to keep’</td>
<td>šimer ‘to preserve’</td>
</tr>
<tr>
<td></td>
<td>gadal ‘to grow’</td>
<td>gidel ‘to cultivate’</td>
</tr>
<tr>
<td></td>
<td>xašav ‘to think’</td>
<td>xišev ‘to calculate’</td>
</tr>
<tr>
<td>b.</td>
<td>laxaš ‘to whisper’</td>
<td>lixšeš ‘to whisper repeatedly’</td>
</tr>
<tr>
<td></td>
<td>caxak ‘to laugh’</td>
<td>cixkek ‘to giggle’</td>
</tr>
</tbody>
</table>

Whether the template is just <i,e> or CVCVCV with potential expansion, it is impossible to predict reduplication; i.e. given that template and the root/base, the mapping is partially arbitrary.
The challenge of reduplication

- A base with two consonants gives partial or full reduplication in this verbal type

<table>
<thead>
<tr>
<th>a.</th>
<th>mila</th>
<th>‘word, n.’</th>
<th>milmel</th>
<th>‘to mumble’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>daf</td>
<td>‘sheet of paper, n.’</td>
<td>difdef</td>
<td>‘to leaf through (a book)’</td>
</tr>
<tr>
<td></td>
<td>zaping</td>
<td>‘switching channels repeatedly’</td>
<td>zipzep</td>
<td>‘to switch channels repeatedly’</td>
</tr>
<tr>
<td>b.</td>
<td>likek</td>
<td>‘to lick’</td>
<td>liklek</td>
<td>‘to lick repeatedly’</td>
</tr>
<tr>
<td></td>
<td>mišeš</td>
<td>‘to feel, grope’</td>
<td>mišmeš</td>
<td>‘to feel, grope repeatedly’</td>
</tr>
<tr>
<td></td>
<td>dilel</td>
<td>‘to dilute (trns.)’</td>
<td>dildel</td>
<td>‘to thin down over a period’</td>
</tr>
</tbody>
</table>
The challenge of reduplication

• A base with two consonants gives partial or full reduplication in this verbal type

(a) mila ‘word, n.’
daf ‘sheet of paper, n.’
zaping ‘switching channels repeatedly’

(b) Is especially telling: the same biradical root can appear with the same vocalization, but with two patterns of reduplication. Again— it is not enough to know the root and the template.

milmel ‘to mumble’
difdef ‘to leaf through (a book)’
zipzep ‘to switch channels repeatedly’

likek ‘to lick’
liklek ‘to lick repeatedly’
mišmeš ‘to feel, grope repeatedly’
dildel ‘to thin down over a period’
The challenge of reduplication

• A base with two consonants gives partial or full reduplication in this verbal type

```
a. mila 'word, n.
daf 'sheet of paper, n.'
zaping 'switching channels repeatedly'

b. likek 'to lick'
mišeš 'to feel, grope'
dilel 'to dilute (trns.)'

milmel 'to mumble'
difdef 'to leaf through (a book)'
zipzep 'to switch channels repeatedly'
liklek 'to lick repeatedly'
mišmeš 'to feel, grope repeatedly'
dildel 'to thin down over a period'
```
The challenge of reduplication

• What is the extra piece of information required for the speaker to derive the reduplicated mapping?
Bat El takes up the challenge of reduplication

Bat El (2006) proposes that it is a constraint COPY, which is associated with certain entries in the lexicon.
Bat El takes up the challenge of reduplication

Indeed, by arbitrarily placing the COPY constraint in a certain position among other markedness constraints, we derive QiTLeL for a triradical base...

<table>
<thead>
<tr>
<th>/davar+ &lt;i,e&gt;/</th>
<th>*_o][_o CC</th>
<th>*[_o CC</th>
<th>COPY</th>
<th>*CODA</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. dvir.dver</td>
<td>*!</td>
<td>**</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>b. dvir.ver</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>c. div.rver</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>d. div.rer</td>
<td></td>
<td></td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>e. di.ver</td>
<td></td>
<td>***!</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>
Bat El takes up the challenge of reduplication

...and full reduplication for a biradical base, e.g. [kav] ‘word’, [kivkev] ‘draw discontinuous line’:

<table>
<thead>
<tr>
<th>/kav+ &lt;i,e&gt;/</th>
<th>*σ][σCC</th>
<th>*[σCC</th>
<th>COPY</th>
<th>*CODA</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. kvi.kev</td>
<td></td>
<td>!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. kiv.kev</td>
<td></td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>c. ki.vev</td>
<td></td>
<td></td>
<td>!</td>
<td>**</td>
</tr>
</tbody>
</table>
Bat El takes up the challenge of reduplication

...and full reduplication for a biradical base, e.g. [kav] ‘word’, [kivkev] ‘draw discontinuous line’:

<table>
<thead>
<tr>
<th>/kav+ &lt;i,e&gt;/</th>
<th>*_{σ}[σCC]</th>
<th>*_{σCC}</th>
<th>COPY</th>
<th>*CODA</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. kvi.kev</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. kiv.kev</td>
<td></td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>c. ki.vev</td>
<td></td>
<td></td>
<td>*!</td>
<td>**</td>
</tr>
</tbody>
</table>

This is a welcome result, since the same configuration of the COPY constraint gives us the two attested patterns.
Bat El takes up the challenge of reduplication

However, it is certainly not a very welcome move to have morpheme-specific constraints or constraint hierarchies...

<table>
<thead>
<tr>
<th>/kav+ &lt;i,e&gt;/</th>
<th>*σ][σCC</th>
<th>*[σCC</th>
<th>COPY</th>
<th>*CODA</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. kvi.kev</td>
<td></td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b. kiv.kev</td>
<td></td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>c. ki.vev</td>
<td></td>
<td></td>
<td>*!</td>
<td>**</td>
</tr>
</tbody>
</table>
Bat El takes up the challenge of reduplication

Moreover, since Bat El has no template to satisfy, she explains the other pattern possible for biradicals with the same constraint... in another position.

[kod] ‘code’  =>  [kided] ‘encode’

<table>
<thead>
<tr>
<th>/kod+ &lt;i,e&gt;/</th>
<th>*$<em>\sigma$][$</em>\sigma$CC</th>
<th>*[$_\sigma$CC</th>
<th>*CODA</th>
<th>COPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. kdi.ked</td>
<td>!</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. kid.ked</td>
<td>**!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ki.ded</td>
<td>!</td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>
We take on the challenge of reduplication

- I will now suggest an alternative (which is somewhat similar to the proposal in Buckley 1990).

- Roots may have internal structure, a process exemplified by IH root augmentation
  
<table>
<thead>
<tr>
<th>Original Root</th>
<th>Reduplicated Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>katav ‘write’</td>
<td>źiχtev ‘rewrite’</td>
</tr>
<tr>
<td>kafal ‘be doubled’</td>
<td>źiχpel ‘copy’</td>
</tr>
<tr>
<td>delek ‘fuel’</td>
<td>tidleks ‘to fuel’</td>
</tr>
</tbody>
</table>
We take on the challenge of reduplication

- Augmentation is affixation at the root level.
- Crucially, the now quadriradical root shifts to the QiTeL (the prototypical 4radical verb type).

- Roots may have internal structure, a process exemplified by IH root augmentation

<table>
<thead>
<tr>
<th>Word</th>
<th>Root</th>
<th>Augmentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>katav</td>
<td>וקְתָב</td>
<td>וַיִּקָּתָבְׁ</td>
</tr>
<tr>
<td>kafal</td>
<td>וָקָּפָל</td>
<td>וַיִּשְׁלַחְו</td>
</tr>
<tr>
<td>delek</td>
<td>וָדָלֵק</td>
<td>וְתֵלֵק</td>
</tr>
</tbody>
</table>
We take on the challenge of reduplication

- If roots can be augmented and have internal structure, the same can be true of templates:

 Unaugmented 4R template (middle CV optional in IH):

```
C  V  C  V  (C  V)  C  V
```

 Augmented 4R template:

```
C  V  C  V  (C  V)  C  V  +C  V
```
We take on the challenge of reduplication

- Templatic augmentation is a derivational morpheme. It is added to derive pluractional or diminutive verbs, e.g. *milmel* ‘mumble’, *tsîxkek* ‘gigle’

Unaugmented 4R template (middle CV optional in IH):

\[
\text{C V C V (C V) C V}
\]

Augmented 4R template:

\[
\text{C V C V (C V) C V +C V}
\]
We take on the challenge of reduplication

- Recall edge-in association.

- Normal root+ Unaugmented 4R template (middle CV optional in IH):

\[
\begin{array}{c}
\text{ʃimeʔ} \\
\text{ʃiməʔ}
\end{array}
\]

'[ʃimeʔ] ‘preserve’
We take on the challenge of reduplication

- Recall edge-in association.

- **Augmented** root + Unaugmented 4R template (middle CV optional in IH):

```
ʃ + k
\[ \begin{array}{c}
C & V & C & V & (C & V) & C & V \\
\end{array} \]
```

\[ [ʃixtev] \quad \text{‘rewrite’} \]
We take on the challenge of reduplication

- Recall edge-in association.

- Normal root+ augmented 4R template:

  \[
  \begin{array}{c}
  \sqrt{ʦ \chi \ k} \\
  \text{[ʦiχkek]} \quad \text{‘giggle’}
  \end{array}
  \]
We take on the challenge of reduplication

- Recall edge-in association.

- Normal root+ augmented 4R template:

```
[ʦiχkek] 'giggle'
```

Edge-in association proceeds twice.
We take on the challenge of reduplication

- Recall edge-in association.

- Normal root+ augmented 4R template:

  The k cannot delink in favor of the reduplicant χ because this is its only association.

  \[ \text{[ʦiχkek]} \quad \text{‘giggle’} \]
We take on the challenge of reduplication

- Recall edge-in association.

- **biradical root** + **augmented 4R template**:

  Edge-in association proceeds twice

```
  d   l
 / \
C V C V (C V) C V +C V
```
We take on the challenge of reduplication

- Recall edge-in association.

- **biradical root** + **augmented 4R template**:

  - leftward spreading association proceeds twice
We take on the challenge of reduplication

- Recall edge-in association.

- **biradical root** + **augmented 4R template**:

  The \( \ell \) delinks in favor of the reduplicant \( d \) because it is associated elsewhere.

[dildel] ‘make few’
We take on the challenge of reduplication

- Recall edge-in association.

- Biradical root+ Unaugmented 4R template (middle CV optional in IH):

```
  d    I
  /\   /\  \\
 C  V  C  V  (C  V)  C  V
```
We take on the challenge of reduplication

- Recall edge-in association.

- Biradical root+ Unaugmented 4R template (middle CV optional in IH):

```
leftward spreading
```

```
    d  l
   /  /
  C   C
 /    /  
V    V   (C  V)
       C  V
```

[dileel] ‘make few’
## Summary of our take on reduplication

<table>
<thead>
<tr>
<th>Root</th>
<th>Template</th>
<th>4R</th>
<th>augmented 4R</th>
</tr>
</thead>
<tbody>
<tr>
<td>DQTL</td>
<td>DiQTeL</td>
<td>ħixtev ‘rewrite’</td>
<td>- (same as 4R)</td>
</tr>
<tr>
<td>QTL</td>
<td>QiTeL</td>
<td>ħimeb ‘preserve’</td>
<td>QiTLeL tsizek ‘gigle’</td>
</tr>
<tr>
<td>QT</td>
<td>QiTeT</td>
<td>dilel ‘dilute’</td>
<td>QiTQeT dildel ‘make few’</td>
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Summary of our take on reduplication

<table>
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As in Bat El, this solution has the same morpheme structure for the two pluractionals QiTLeL and QiTeT. But it doesn’t need to say anything for QiTeT (this is not copy, but template satisfaction)
Summary of our take on reduplication

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<td>QiTLeL tsiχkek ‘gigle’</td>
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As in Bat El, this solution has the same morpheme structure for the two pluractionals QiTLeL and QiTeT. But it doesn’t need to say anything for QiTeT (this is not copy, but template satisfaction).

Again, the usefulness of the template, as opposed to just vowels, is made obvious.
Summary

• There have been attempts – and we’ve not seen all of them – to reduce the template to its vowels.

• This does not work. Sometime it is only less economic; but other times it is outright insufficient.
Summary

- In the next lecture, we will look at the issue of roots and templates from two other angles:
  - The psycholinguistic angle
  - The consequences for a universal theory of morphology.
Issues in non-concatenative Morpho-phonology

External evidence for the Semitic root
“External”

• For the purpose of this class there are two types of external evidence.
  1) to formal linguistics,
  2) to Afro-asiatic.

• We will discuss evidence from psycholinguistic experiments, evidence from Aphasia, and general morphological theory.
Priming

- In **psycholinguistics**, it is common to check the relatedness of words by looking for a priming effect.
In psycholinguistics, it is common to check the relatedness of words by looking for a priming effect.

Participants are shown a screen
Priming

• In psycholinguistics, it is common to check the relatedness of words by looking for a priming effect.

Then a word, but very quickly, such that they are not aware that they saw it surf
In psycholinguistics, it is common to check the relatedness of words by looking for a priming effect.

Then another word, and they are asked whether they recognize the word serfdom.
It was found that a subconsciously perceived word facilitates a morphologically related word.

If you’re shown “govern”, even though you don’t know you’ve seen it, you’ll recognize “government” faster.

Interestingly, this work for sing-sang too.
Priming in IH

• Priming is seen as a way of measuring relatedness. It is thus a promising criterion to check whether words in Semitic are related through the tripartite set, the root.

• If a word with a given root primes another word with that root, even though the root is not in the same place in the word (χαʃa vant-hi χʃi v) and surrounded by other vowels, this will prove that it is a meaningful unit in lexical organization.
Frost et al. (1997) showed exactly that. They gave participants the following:

<table>
<thead>
<tr>
<th>Forward mask</th>
<th>Identity</th>
<th>Related</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime</td>
<td>tzmwrt</td>
<td>zmr</td>
<td>tmr</td>
</tr>
<tr>
<td>Target</td>
<td>tzmwrt</td>
<td>tzmwrt</td>
<td>tzmwrt</td>
</tr>
</tbody>
</table>

'orchestra'
Frost et al. (1997) showed exactly that. They gave participants the following:

Unsurprisingly, they found that the root primes a target which includes it, while the non-root doesn’t.

<table>
<thead>
<tr>
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<th>IDENTITY</th>
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<th>CONTROL</th>
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<td>tmr</td>
</tr>
<tr>
<td>target</td>
<td>tzmwrt</td>
<td>tzmwrt</td>
<td>tzmwrt</td>
</tr>
<tr>
<td>‘orchestra’</td>
<td>חוסרת</td>
<td>חוסרת</td>
<td>חוסרת</td>
</tr>
</tbody>
</table>
**Priming in IH**

Unsurprisingly, they found that the root primes a target which includes it, while the non-root doesn’t. This was true whether the orthography of the root corresponded to an existing word, as below, or not.

<table>
<thead>
<tr>
<th>Forward mask</th>
<th>***</th>
<th>***</th>
<th>***</th>
</tr>
</thead>
<tbody>
<tr>
<td>prime</td>
<td>tzmwrt</td>
<td>zmwr</td>
<td>tmwr</td>
</tr>
<tr>
<td></td>
<td>תזמורת</td>
<td>אופר</td>
<td>חפר</td>
</tr>
<tr>
<td>target</td>
<td>tzmwrt</td>
<td>tzmwrt</td>
<td>tzmwrt</td>
</tr>
<tr>
<td>‘orchestra’</td>
<td>תזמורת</td>
<td>תזמורת</td>
<td>תזמורת</td>
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<tr>
<th>Forward mask</th>
<th>Prime</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>tzmwrt</td>
<td>zmr</td>
<td>tzmwrt</td>
</tr>
<tr>
<td>tzmwrt Hebrew</td>
<td>ימר</td>
<td>tzmwrt</td>
</tr>
<tr>
<td>tzmwrt Arabic</td>
<td>يمر</td>
<td>tzmwrt</td>
</tr>
</tbody>
</table>

Can we conclude that the final word has been said? **Not at all!**
Priming in IH

- Targets such as [tizmo$et$] are complex. The templat involves a prefix *ti-* and a suffix *-et*.

- Participants could have been sensitive to the stem consonants, as Bat El claims in reaction to these findings.

- Frost (p.c.) says: “*ti-* is not a prefix...”
Priming in IH – worrying results...

• Also, Frost et al. found that homophonous roots also prime each other. For instance, the words *mebagel* ‘spy’, *tavgil* ‘exercise’ and *végel* ‘foot’ were found to prime each other.

• But the semantic relations between them are completely opaque. Are we really probing the root here?
Frost et al. found that two items with different roots in the same verbal template prime each other, e.g. [hitχil] and [hifsik].

This suggest, according to them, that verbal templates are morphemes

gil-u et amébika]...
discover.PST-3PL ACC America
Yet there is more to say: Frost (p.c.) admits that the finding is only true for the unsuffixed form, i.e. \[ts\text{ax}ak\text{-ti}\] does not prime \[katav\text{-ti}]\...

More troubling are the findings regarding weak verbs.
Frost et al. find no priming between weak and strong verbs in a given verbal type, or even between two weak verbs in the same type!

They conclude that weak verbs do not use the same morpheme as strong verbs.
Priming in IH templates – worrying results

• The existence of weak roots in exactly the same number of Binyamin as triradical ones becomes an accident...

The two types of V-final stems and their C-final counterparts in Types I-III

<table>
<thead>
<tr>
<th>Type</th>
<th>3past</th>
<th>1/2Past</th>
<th>present</th>
<th>future</th>
<th>infinitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>C-final</td>
<td>karac</td>
<td>karac-</td>
<td>korec</td>
<td>-kroc</td>
</tr>
<tr>
<td></td>
<td>V-final1</td>
<td>kara</td>
<td>kara-</td>
<td>kore</td>
<td>-kra</td>
</tr>
<tr>
<td></td>
<td>V-final2</td>
<td>kara</td>
<td>kari-</td>
<td>kore</td>
<td>-kre</td>
</tr>
<tr>
<td>II</td>
<td>C-final</td>
<td>pinek</td>
<td>pinek-</td>
<td>m(e)-fanek</td>
<td>-fanek</td>
</tr>
<tr>
<td></td>
<td>V-final1</td>
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</tr>
<tr>
<td>III</td>
<td>C-final</td>
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<td>hifrix</td>
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</table>
Priming in IH templates – worrying results

• Moreover, it is possible to show that speakers perceive weak and strong verbs as pertaining to the same class

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<tr>
<th>Type</th>
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<tbody>
<tr>
<td>I</td>
<td>C-final</td>
<td>karac</td>
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<td>korec</td>
<td>-kroc</td>
</tr>
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Priming in IH templates – worrying results

The weak final realization overrides that of the Type. past=>[a], present => [e]/[i], future => [e], inf. => [ot], independently of the vocalization of the triradical verb.

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Priming in IH templates – worrying results

The weak final realization overrides that of the Type. past=>[a], present => [e]/[i], future => [e], inf. => [ot], independently of the vocalization of the triradical verb.

But this is not the case in Type IV, where the identity of past and present stems in the triradical version of the type forces an identity in the weak-final version.

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<td>nikre-</td>
<td>nikra</td>
<td>-ikare</td>
<td>lehi-kare</td>
</tr>
</tbody>
</table>
Priming - Summary

- To summarize, the results from priming speak in favor of the root and template as important in perception.

- That said, it is not clear what the units we are probing are in reality. They do not seem to be the root in the semantic sense.
Bat El also raises the issue of orthography. It might be the case that IH speakers learned to use the triradical set in deciphering written text – this doesn’t mean that this is a lexical storage strategy.

However, more recent work on Maltese by Ussishkin & Twist replicated the findings using exclusively auditory primes...
Interim on reading
The “Cambridge University” Phenomenon

According to a research at Cambridge University, it doesn't matter in what order the letters in a word are, the only important thing is that the first and last letter be at the right place. The rest can be a total mess and you can still read it without problem. This is because the human mind does not read every letter by itself, but the word as a whole.

**Transposed Letter Effect**
The “Hebrew University” phenomenon
The “Hebrew University” phenomenon

‘The library received the large donation from the food factory’

(Velan & Frost, 2007)
‘The library received the large donation from the food factory’

IMPOSSIBLE TO READ!!! In IH, it is crucial that the root consonants be in the right order.

(Velan & Frost, 2007)
The “Hebrew University” phenomenon

‘The library received the large donation from the food factory’

hsfryya kyblh ʔt htrwm hgdwlh mmffl hzmwn
[hasifviya kibla et hatbuma hagdola mimf?al hamazon]

hsrfyya kylbh ʔt htrwm hgdwlh mmffl hzmwn

However, note that there are other differences between the IH and English examples. In English, the first and last consonants are never suffixes. Moreover, since roots have three Cs, any change destroys the order… It should have been checked with quadriradicals...

(Velan & Frost, 2007)
Evidence from Aphasics

▪ We know that aphasia attacks certain linguistic abilities, but not others.

▪ Prunet et al. (2000) examined a French and Arabic bilingual aphasic. They noticed that he produced 25 metatheses in Arabic

  Target :/is-t-iʕtaːf/ ‘begging’

  Realization: [is-t-iftaːʕ]
Evidence from Aphasics

- All metatheses were of the root consonants, never of affixal consonants.

- In French, there was only one occurrence of Metathesis.

Arabic bilingual aphasic. They noticed that he produced 25 metatheses in Arabic.

Target: /is-t-iʕtaːf/ ‘begging’

Realization: [is-t-iftaːʕ]
Evidence from Aphasics

Prunet et al. concluded that this follows from the consonantal nature of roots in Arabic, vs. the syllabified, continuous nature of roots in French.

- Prunet et al. (2000) examined a French and Arabic bilingual aphasic. They noticed that he produced 25 metatheses in Arabic.

  Target: /is-t-iʕtaːf/ ‘begging’
  Realization: [is-t-iftaːʕ]
Evidence from Aphasics

- Yet once again, the relevant unit can be the stem consonants, not a root...

- This would be a **surface root**, extracted from the stem whose vowels are morphemes in Semitic – something nobody contests – and not an abstract underlying root (Davis and Zawaydeh 2001, Rattcliffe 2004)
Evidence from Aphasics

- The crucial datum should come from weak verbs.

- Recall that such verbs have non-surface-true glides, such that /mawat/ => [maːt] ‘he died’
Evidence from Aphasics

- Interestingly, Idrissi et al. (2002) did find such cases in the speech of the same aphasic:

<table>
<thead>
<tr>
<th>m-resurfacing: /qawaʃ/</th>
<th>covert: /y-awʃid-u/</th>
</tr>
</thead>
<tbody>
<tr>
<td>→ qaaʃ ‘bottom’</td>
<td>→ y-aʃid ‘he promises’</td>
</tr>
<tr>
<td>→ error waaqiʃ ‘reality’</td>
<td>→ error ſuud ‘stick’</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>t-resurfacing: /aʔwaʔ-a/</th>
<th>/aʔyaʃ-a/</th>
</tr>
</thead>
<tbody>
<tr>
<td>→ ʔaʔaaʔ ‘he lit’</td>
<td>→ ʔaʔaʃ ‘he broadcasted’</td>
</tr>
<tr>
<td>→ error ḍawʔ ‘light’</td>
<td>→ error m-uðiiʃ ‘radio announcer’</td>
</tr>
</tbody>
</table>

- This really nails the argument: the aphasic has a problem with the mapping of the **underlying** root.
Bat El (2011) provides evidence from her own Aphasic, who manipulates entire stems...

<table>
<thead>
<tr>
<th>Target</th>
<th>Error</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>yi-zlol ‘gluttonize’</td>
<td>3rd ms.sg. Fut. – FUT</td>
<td>me-zalal Pres. – PAST</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• zalal ‘glutonized 3rd ms.sg.’</td>
</tr>
<tr>
<td>ti-kfoc ‘jump’</td>
<td>2nd ms.sg. Fut. – FUT</td>
<td>yi-kafac-ta Fut. – PAST – Past</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• kafac ‘jumped 3rd ms.sg.’</td>
</tr>
<tr>
<td>yi-kfoc ‘jump’</td>
<td>3rd ms.sg. Fut. – FUT</td>
<td>ye-kofec Fut – PRES</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• kofec ‘jumps ms.sg.’</td>
</tr>
<tr>
<td>soxav-im ‘carry’</td>
<td>PRES – ms.pl.</td>
<td>saxav-im PAST – Pres</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• saxav ‘carried 3rd ms.sg.’</td>
</tr>
</tbody>
</table>

(Data provided by Naama Friedmann)
Evidence from Aphasics

This of course is irrelevant; nobody claims that stems don’t exist...

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<td>• saxav ‘carried 3rd ms.sg.’</td>
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</table>
• Evidence from psycholinguistic experiments and aphasia support the importance associated to the consonants of the root.

• In nearly all of the cases, the findings can be reinterpreted as arguing for a surface root, extracted online from the stem.
Summary of non-formal evidence

• It is unsurprising that consonant-extraction should be a deciphering strategy in reading or perception in general in Semitic, since in these languages the rest of the word is another morpheme.

• In my opinion, only the evidence from the aphasic that forces non-surface-true radicals to reappear poses a challenge for stem-based accounts.
Back to formal linguistics

• How is a word like *government* stored? Is the decomposition into *govern+ment* only a linguist’s passtime, or does it represent a cognitive reality?

• This is a general cross-linguistic debate.
Back to formal linguistics
Back to formal linguistics

• Some linguists, famously Anderson (1992) claim that since words are stored as a whole, decomposition is an illusion. Bat El was Anderson’s student...

• Others might accept the decomposition of *govern*+*ment* because *govern* exists independently, but they won’t accept *sacred*+*ment*.
Yet in my opinion there is overwhelming evidence for decomposition. One piece of evidence I like comes from Germanic:

<table>
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<th>Yiddish</th>
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<tbody>
<tr>
<td>No prefix</td>
<td>nem-ən</td>
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</tr>
<tr>
<td></td>
<td>tsegər-n</td>
<td>gə-tsegər-t</td>
</tr>
<tr>
<td>Particle</td>
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<td>ojf-gə-num-ən</td>
</tr>
<tr>
<td>Prefix</td>
<td>tse-nem-ən</td>
<td>tse-num-ən</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*tse-gə-num-ən</td>
</tr>
</tbody>
</table>
If speakers were not aware of the fact that [ʦe] (for example) is prefixed, how would they know not to add [gə-] before it? Note that when [ʦe] is not a prefix, it does not resist [gə-].

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Back to formal linguistics

• More evidence from the form of the definite article in south-western Sardinian (Lai 2016):

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<tr>
<th></th>
<th>a. s+liquid from SWM</th>
<th>b. s+liquid with s as a prefix</th>
</tr>
</thead>
<tbody>
<tr>
<td>/is sroyus/ ‘the fathers-in-law’</td>
<td>is sroyus</td>
<td>*izi zroyus</td>
</tr>
<tr>
<td>/is slumbaus/ ‘the cripples’</td>
<td>*is slumbaus</td>
<td>izi zlumbaus</td>
</tr>
</tbody>
</table>
Roots beyond Semitic

• Another objection to roots in Semitic was that they are underspecified in terms of their Semantic import.

• Yet we needn’t go far to find the same phenomena outside Afro-Asiatic
### Roots beyond Semitic

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</tr>
<tr>
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<td>ba-nem-ən</td>
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<td>‘begin’</td>
</tr>
<tr>
<td></td>
<td>ojs-nem-ən</td>
<td>ojs-gə-num-ən</td>
<td>‘succeed’</td>
</tr>
<tr>
<td></td>
<td>duʁχ-nem-ə</td>
<td>duʁχ-gə-num-ən</td>
<td>‘penetrate’</td>
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<tr>
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<td>fiʁ-nem-ə</td>
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## Roots beyond Semitic

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One must accept that the stem is the same in all these forms, because it undergoes the same allomorphy. Whatever the meaning is of [nem]~[num] in all these forms, it is pretty underspecified...
## Roots beyond Semitic

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Roots are real entities outside Semitic. The major difference is that roots in Semitic are discontinuous and therefore unpronounceable, whereas roots outside Semitic are usually continuous. As a result, they can be confused with “stems”, because they and are pronounceable.
Distributed Morphology

- For reasons like these, roots have experienced a revival, in work in the theory of Distributed Morphology (DM, e.g. Embick 2010) and related theories (e.g. Hagit Borer’s recent work)

- These theories assume that all initial derivations (i.e. non-cyclic) in all languages are root-based.

(11) *pensador*

The structure of Spanish *pensador* ‘thinker’, in Embick (2010)
Distributed Morphology

- In such approaches, another important aspect of roots is that they are not categorized, i.e. not yet attributed a category.

- It is the syntactic structure that will determine the category of a given item. Roots do not have categories.

(11) *pensador*
Distributed Morphology

- Semitic languages are often mentioned to support this claim. Outside Semitic, this is less obvious...

- For instance, the root *nem* of Yiddish, however underspecified it may be, is not directly present in the nominal morphology...

- It seems that the freedom that Semitic roots have is not shared by the roots of concatenative languages, at least not to the same extent.
Distributed Morphology

- As mentioned, not all derivations are based on roots: some are based on items already having a category.

- It become an endeavor of the theory to show that derivations based on roots or based on categorized structure are essentially different.

- In a famous paper, Arad (2003) claimed that this distinction is indeed necessary.
Arad’s locality

▪ Arad discusses two types of verbs in English noted by Kipasky (1982), represented here by *hammer* and *tape*.

▪ Both verbs seem to be derived from a noun. However:

a. He hammered the nail with a rock  OK
b. He taped the picture with nails  OK

▪ Arad/Kiparsky claim that the verb *hammer* is freer in its interpretation than the verb *tape*. 
Arad’s locality

- This is formalized by deriving ‘to hammer’ from the same root as ‘(a) hammer’, but deriving ‘to tape’ from the noun tape.

(24)a.  
```
     V
    /\hammer
   V
```

(24)b.  
```
     N
    /\hammer
   N
```

(25)a.  
```
     N
    /\tape
   N
```

(25)b.  
```
     V
    /\tape
   N
```
Arad’s locality

- This is formalized by deriving ‘to hammer’ from the same **root** as ‘(a) hammer’, but deriving ‘to tape’ **from the noun** tape.

But why should the derivation from the noun be constrained by the noun’s meaning?

(25)a.  

(25)b.
Distributed Morphology

(13) Locality constraint on the interpretation of roots: roots are assigned an interpretation in the environment of the first category-assigning head with which they are merged. Once this interpretation is assigned, it is carried along throughout the derivation.

(25)a. 

N -> N -> \sqrt{tape}

b. 

V -> N -> \sqrt{tape}
Distributed Morphology

More evidence from Kiparsky brought forth by Arad

(28) récord_N/recórd_V, súbject_N/subjéct_V, óbject_N/objéct_V,
     próject_N/projéct_V, rébel_N/rebél_V, digést_N/dígest_V,
     cónduct_N/condúct_V, ábstract_N/abstráct_V, cómbine_N/combíne_V,
     éxploit_N/exploít_V, próduce_N/producé_V, défect_N/deféct_V,
     cóntest_N/contést_V, cónvict_N/convíct_V, cóntact_N/contráct_V.

Stress shift accompanied by semantic freedom
Arad’s locality

More evidence from Kiparsky brought forth by Arad

(29)a. permit\textsubscript{V} – permit\textsubscript{N} -> permit\textsubscript{V}
b.  affix\textsubscript{V} – affix\textsubscript{N}  -> affix\textsubscript{V} 
c.  protést\textsubscript{V} – prótest\textsubscript{N} -> prótest\textsubscript{V} 
d.  digést\textsubscript{V} – digest\textsubscript{N} -> digest\textsubscript{V} 
e.  compóund\textsubscript{V} – cómpound\textsubscript{N}  -> cómpound\textsubscript{V} 
f.  contráct\textsubscript{V} – cóntract\textsubscript{N} -> cóntract\textsubscript{V} 

Absence of Stress shift accompanied by lesser semantic freedom
Arad’s locality

\[
V \Rightarrow [\text{k\æntrækt}] \\
V \Rightarrow [\text{\textipa{kántrækt}}]
\]

\[
N \Rightarrow [\text{k\æntrækt}] \\
N \Rightarrow [\text{\textipa{kántrækt}}]
\]

\[
V \Rightarrow [\text{\textipa{kántrækt}}]
\]
Arad’s locality

- To summarize, Arad claims that in many cases, the two types of derivation – root-based and word-based – are needed.

- Word-based derivation is constrained by both the meaning and the form of the base, whereas, root-based derivation is not.
Arad’s locality

▪ This takes us back to the beginning of the course and Bat El’s generalization of her findings of cluster preservation in denominal verbs.

▪ One of Bat El’s claim was that her view is more economic, because it only requires one mechanism (Mel.Over.), as contrasted with a view that would have one mechanism for decategoricals and another for deradicals.
Arad’s locality

- Now it seems to be independently necessary to distinguish between deradical and decategorical derivation:

\[
\begin{align*}
V &= [\text{saga qb}] \text{ ‘close’} \\
N &= [\text{misgé bet}] \text{ ‘frame’} \\
V &= [\text{misger}] \text{ ‘to frame’} \\
N &= [\text{misgé bet}] \text{ ‘frame’}
\end{align*}
\]
Appraisal of Arad’s Locality

• Arad’s approach has a weak point: it is circular.

• How do we know that a verb is denominal? Because it preserves aspect of the purported base.

• Why does it preserve aspects of the base? Because it’s denominal!
Appraisal of Arad’s Locality

• Arad’s approach has a weak point: it is circular.

• How do we know that a verb is denominal? Because it preserves aspect of the purported base.

• Why does it preserve aspects of the base? Because it’s denominal!

If one finds a counter example to Arad’s generalization about form preservation, she can say that it isn’t derived from the categorized structure, but from the root
Appraisal of Arad’s Locality

• Arad’s approach has a weak point: it is circular.

• How do we know that a verb is denominal? Because it preserves aspect of the purported base.

• Why does it preserve aspects of the base? Because it’s denominal!

In principle, semantics and form should coincide, but then again, the theory does not claim that deradical derivations must have additional freedom...
Appraisal of Arad’s Locality

• There are quite a few counter-example to semantic preservation... From IH:

  bajit ‘home’        hitbajet   ‘home in’
  zajin ‘penis’       zijen     ‘screw’
  bóbeg ‘screw’       hitbóbeg   ‘insert oneself’
  kélev ‘tap’         hitkalev  ‘live in basic conditions’
  ḥalef ‘א’           ḥilef     ‘tame’
  ḥalila ‘plot’       ḥeḥelil   ‘frame someone’
Summary

• One of the basic objections against the root is that it sets the Semitic system apart from other systems.

• Yet there are popular frameworks which also employ roots systematically in the analysis of concatenative languages. If they are correct, than that objection is moot.
Summary

• Still, what **does** set Semitic languages apart? Can we really say that roots in Semitic are like Yiddish *nem*~*num*?

• There are several answers to this question, but alas, not today.
Appendix regarding the coming into existence of Semitic languages

First stage:

grammatical morphemes

1sg = [a-]
past = [-u]

verbs

‘write’ = [ktav]
‘start’ = [txil]
‘grow’ = [gdil]

Following Deutscher (2005)
Appendix regarding the coming into existence of Semitic languages

First stage:

grammatical morphemes

1sg = [a-]
past = [-u]

verbs

‘write’ = [ktav]
‘start’ = [txil]
‘grow’ = [gdil]

= Spanish

Following Deutscher (2005)
Appendix regarding the coming into existence of Semitic languages

Second stage:

grammatical morphemes

1sg = [a-]
past = [-u]

verbs
‘write’ = [ktav]
‘start’ = [txil]
‘grow’ = [gdil]
‘open’ = [ptuḥ] => [ptuaḥ]

Following Deutscher (2005)
Appendix regarding the coming into existence of Semitic languages

Second stage

<table>
<thead>
<tr>
<th>Future</th>
<th>Past</th>
</tr>
</thead>
<tbody>
<tr>
<td>[aktav]</td>
<td>[aktavu]</td>
</tr>
<tr>
<td>[atxil]</td>
<td>[atxilu]</td>
</tr>
<tr>
<td>[agdul]</td>
<td>[agdulu]</td>
</tr>
<tr>
<td><strong>[aptuʔaħ]</strong></td>
<td><strong>[aptuʔu]</strong></td>
</tr>
</tbody>
</table>

Following Deutscher (2005)
Appendix regarding the coming into existence of Semitic languages

Third stage: past marking is lost

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<tbody>
<tr>
<td>[aktav]</td>
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<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
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<td>[agdul]</td>
<td></td>
</tr>
<tr>
<td>[aptuḥ]</td>
<td>[aptuḥ]</td>
<td></td>
</tr>
</tbody>
</table>

Become opaque!

Following Deutscher (2005)
Appendix regarding the coming into existence of Semitic languages

Forth stage: reanalysis

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<tbody>
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</tr>
<tr>
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<td>[agdul]</td>
</tr>
<tr>
<td>[aptah]</td>
<td>[aptuḥ]</td>
</tr>
</tbody>
</table>

Becomes future marker!, stem vowel /u/ dropped

Following Deutscher (2005)
Appendix regarding the coming into existence of Semitic languages

Fifth stage: generalizing

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</tr>
<tr>
<td>[atxal]</td>
<td>[atxil]</td>
</tr>
<tr>
<td>[agdal]</td>
<td>[agdul]</td>
</tr>
<tr>
<td>[aptaḥ]</td>
<td>[aptaḥ]</td>
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</table>

Becomes a general future marker!

Following Deutscher (2005)
Appendix regarding the coming into existence of Semitic languages

Fifth stage: generalizing

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<td>[agdul]</td>
</tr>
<tr>
<td>[aptah]</td>
<td>[aptxuh]</td>
</tr>
</tbody>
</table>

Becomes a general future marker!

This is similar to English sing-sang, though it does not depend on the past vocalization.

Following Deutscher (2005)
Appendix regarding the coming into existence of Semitic languages

More information:

grammatical morphemes

*adjective* = [-um]

*adjectivizer* = [ʃa]

verbs

‘lie down’ = [pil]

‘lowered’ = ???

Following Deutscher (2005)
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‘lie down’ = [pil]

‘lowered’ = [ʃa-pil-um]

‘I made low’ = ???

‘I will make low’ = ???

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‘I made low’ = [a-ʃa-pil]

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Following Deutscher (2005)
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‘I will make low’ = [a-ʃa-pal]

Syncope!
V=> ø / VC.CV

Following Deutscher (2005)
Appendix regarding the coming into existence of Semitic languages

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verbs

‘lie down’ = [pil]

‘lowered’ = [ʃaplum]

‘I made low’ = [aʃpil]

‘I will make low’ = [aʃpəl]

Consonantal Emancipation!

Following Deutscher (2005)
Issues in non-concatenative Morpho-phonology

The fate of Israeli Hebrew gutturals
Today

• We will look at a case study of gutturals in IH.

• This is a misnomer, because there are no phonetic gutturals in IH.

• On the other hand, there are many guttural effects.
Today

• We will look at a case study of gutturals in IH.

• This is a misnomer, because there are no phonetic gutturals in IH.

• On the other hand, there are many guttural effects.

So what is the story?
Background: Biblical Hebrew???
Background: Biblical Hebrew

• Four “gutturals”

  Pharyngeal \([\varsigma, \check{\eta}]\)

  Glottal \([\check{\eta}, \eta]\)

• Spirantized velar \([\chi] < /k/\)
Background: Biblical Hebrew

• Four “gutturals”

   Pharyngeal \([\mathcal{F}, \check{h}]\)

   Glottal \([?, h]\)

Were not good internal codas, repaired with following epenthetic \(\text{/a}/:\)

\(/\check{oh}\text{vim}/ \Rightarrow [\check{oh}^{\text{a-v-im}}] \text{ ‘love.PRT-MPL’}\)
Background: Biblical Hebrew

- Four “gutturals”
  - Pharyngeal $[\varsigma, \hbar]$
  - Glottal $[\dot{\varnothing}, \varnothing]$

Were not good internal codas, repaired with **following** epenthetic $/a/$:

/ʔohvim/ => [ʔoh⁹v-im] ‘love.PRT-MPL’

Were not good final codas, after any vowel except $/a/$. repaired with **preceding** epenthetic $/a/$:

/ʃomeʕ/ => [ʃome⁹ʕ] ‘hear.PRT-MSG’
Background: Biblical Hebrew

- Four “gutturals”
  - Pharyngeal $[ʕ, ħ]$
  - Glottal $[ʔ, h]$

 weren’t good internal codas, repaired with following epenthetic /a/: 

In onset position, they did not directly affect the surrounding vowels, other peculiarities are less important.

repaired with preceding epenthetic /a/: 

/someʕ/ $\Rightarrow$ [someʰʕ] ‘hear.PRT-MSG’
Background: Biblical Hebrew

- Four “gutturals”
  - Pharyngeal \([ʕ, ś]\)
  - Glottal \([ʔ, h]\)
  - Spirantized velar \([χ] < /k/\)

Was well behaved

- \(/liχtov/ \Rightarrow [liχtov]\) ‘write’
- \(/limʃoχ/ \Rightarrow [limʃoχ]\) ‘pull’
Background: Israeli Hebrew

- Was revived using
  
  The morphology of Biblical Hebrew

  The phoneme system of Yiddish/Russian
Background: Israeli Hebrew

- Was revived using
  The morphology of Biblical Hebrew
  The phoneme system of Yiddish/Russian
  => No pharyngeals
  No [ʔ]
  Weak [h]
  Phonemic /χ/
As a consequence (speaking roughly)
BH Glottal /ʔ/ ⇒ IH [ø]
BH Glottal /h/ ⇒ IH [ø], rarely [h]
BH Pharyngeal /ʕ/ ⇒ IH [ø]
BH Pharyngeal /ħ/ ⇒ IH [χ]
As a consequence (speaking roughly)

BH Glottal /ʔ/ => IH ø
BH Glottal /h/ => IH ø, rarely [h]
BH Pharyngeal /ʕ/ => IH ø
BH Pharyngeal /ħ/ => IH [χ]

ø can also be realized [ʔ], before a vowel. Our transcription will adopt this realization, because it is more salient graphically. But this is an optional phonetic effect, so we will mark it as superscript.
Background: Israeli Hebrew

- As a consequence (speaking roughly)
  BH Glottal /ʔ/ => IH [ø]
  BH Glottal /h/ => IH [ø], rarely [h]
  BH Pharyngeal /ʕ/ => IH [ø]
  BH Pharyngeal /ħ/ => IH [χ]

- However, BH orthography was preserved, and perhaps accordingly, **all of the guttural effects.**
Guttural effects in Israeli Hebrew

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<tr>
<th>IH</th>
<th>Cf. non guttural</th>
<th>Cf. BH</th>
</tr>
</thead>
<tbody>
<tr>
<td>moʔel</td>
<td>moʃel</td>
<td>mohel</td>
</tr>
<tr>
<td>moalim</td>
<td>moʃlim</td>
<td>mohalim</td>
</tr>
</tbody>
</table>

“Guttural ghost” can’t be in internal coda

<table>
<thead>
<tr>
<th>Šoméa</th>
<th>Šomeʁ</th>
<th>Šomeʕ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Šomʔim</td>
<td>Šomʁim</td>
<td>Šomʕim</td>
</tr>
</tbody>
</table>

“Guttural ghost” can’t be in final coda after [u,i,o,e]

... As in BH...
Guttural effects in Israeli Hebrew

When new words with “gutturals” are introduced through Arabic loans and internal derivations, they also follow these rules. These may thus be called both productive and exceptionless.

“Guttural ghost” can’t be in internal coda

"šomeʁim" (pl)

“Guttural ghost” can’t be in final coda after [u, i, o, e]

... As in BH...
The question

How are these guttural ghosts represented in the knowledge of speakers of Israeli Hebrew?

How do they behave with respect to notions such as template satisfaction, government etc.?
And a more specific question

How are the vowel sequences created by the guttural effect treated?

is [oa] in *moalim* a bisyllabic hiatus [o.a] or a monosyllabic diphthong [oa]?
Preliminary Proposal

- What is left today from the historical guttural is a consonantally-mapped /a/.

of course an /a/ cannot be realized alone on a C position, and so it “unloads” on an adjacent V-slot.

Preliminary Proposal

- When its position is governed from the following nucleus, the realization of this /a/ is inhibited. In this case, [ʔ] may be heard.

\[
\begin{array}{c}
a & u \\
\downarrow & \downarrow \\
c & V & \Rightarrow & [ʔu], [u]
\end{array}
\]
Examples

IH    Cf. non guttural    Cf. BH
moʔel  moʃel      mohel    ‘circumcizer’

m o a e l
|   |   |   |
C V C V C V

m o f e l
|   |   |   |   |
C V C V C V
Examples

IH    Cf. non guttural    Cf. BH
moalim  moʃlim  moh^a^lim ‘(pl)’

\[
\begin{array}{ccc}
\text{m} & \text{o} & \text{a} & \text{l} & \text{i} & \text{m} \\
\text{C} & \text{V} & \text{C} & \text{V} & \text{C} & \text{V}
\end{array}
\]
\[
\begin{array}{ccc}
\text{m} & \text{o} & \text{ʃ} & \text{l} & \text{i} & \text{m} \\
\text{C} & \text{V} & \text{C} & \text{V} & \text{C} & \text{V}
\end{array}
\]
### Examples

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<td>\textit{ʃomⁿim} ‘hear.PRT.MPL’</td>
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<tr>
<th>\textit{ʃom a i m}</th>
<th>\textit{ʃom b i m}</th>
</tr>
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<tbody>
<tr>
<td>\textit{C V C V C V C V}</td>
<td>\textit{C V C V C V C V C V}</td>
</tr>
</tbody>
</table>

\textit{ʃ} non guttural
Examples

IH      Cf. non guttural      Cf. BH
ʃomʔim  ʃomʁim               ʃomʕim ‘hear.PRT.MPL’

ʃ o m a i m
C V C V C V C V

ʃ o m b i m
C V C V C V C V C V

cf.

So far, so good.
## A puzzle

<table>
<thead>
<tr>
<th></th>
<th>sg.</th>
<th>pl.</th>
</tr>
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<tbody>
<tr>
<td>3-radical</td>
<td>[dugam]</td>
<td>[dugmu]</td>
</tr>
<tr>
<td>4-radical</td>
<td>[tuʁgam]</td>
<td>[tuʁgemu]</td>
</tr>
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</table>

=> /a/ absent from plural representation.  
=> *CCC, epenthesis gives [CCeC]
A puzzle

• $V_3$ is realized despite being governed, because it has a job to do, namely govern $V_2$. 

```
t u k       g e m u
  |   |   |   |   |   |
  C  V  C  V_2  C  V_3  C  V
```
A puzzle

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<td>[tuʁgemu]</td>
<td>‘be translated’</td>
</tr>
<tr>
<td>4-radical</td>
<td>[ʃuabad]</td>
<td>[ʃuabdulu]</td>
<td>‘be enslaved’</td>
</tr>
</tbody>
</table>
A puzzle

• $V_3$ does **not** have a job to do, because /a/ is unloaded on $V_2$. It is therefore silenced.
## A puzzle

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<td>Redup.</td>
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<td></td>
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<td>2-radical</td>
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<th>sg.</th>
<th>pl.</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-radical</td>
<td>[dugam]</td>
<td>[dugmu]</td>
<td>‘be perfected’</td>
</tr>
<tr>
<td>4-radical</td>
<td>[tuʁgам]</td>
<td>[tuʁgemu]</td>
<td>‘be translated’</td>
</tr>
<tr>
<td>4-radical</td>
<td>[ʃuabad]</td>
<td>[ʃuabd̠u]</td>
<td>‘be enslaved’</td>
</tr>
</tbody>
</table>

Redup.

<table>
<thead>
<tr>
<th>Radicals</th>
<th>sg.</th>
<th>pl.</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-radical</td>
<td>[tultal]</td>
<td>[tultelu]</td>
<td>‘be shaken’</td>
</tr>
<tr>
<td>2-radical</td>
<td>[ʃuʃa]</td>
<td>[ʃuʃeʔu]</td>
<td>‘be amused’</td>
</tr>
</tbody>
</table>

Why not *[ʃuʃeʔu], cf. [ʃamʔu]?
A puzzle

Given [ʃuabdu]

Why not *[ʃuaʃˀu]*?

and [ʃomʔim]

c) [ʃ u a]

Why not *[ʃuaʃˀu]*?
A puzzle

Given [ʃuabdu]

and [ʃomʔim]

Why not *[ʃuaʃu]*?

Why does V₃ have to be realized here?
The answer must have to do with both the preceding [ua] sequence, abstent from (b)...

Given [ʃuabdu]

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<tbody>
<tr>
<td>C</td>
<td>V</td>
<td>C</td>
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<td></td>
<td></td>
<td>V₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

Why not *[ʃuaʃu]?

Why does V₃ have to be realized here?
and the second /a/ in (c), but not in (a).

Given \([\text{juabdu}]\)

\[
\begin{array}{ccccccc}
\text{C} & \text{V} & \text{C} & \text{V}_2 & \text{C} & \text{V}_3 & \text{C} & \text{V} \\
\end{array}
\]

\(\Rightarrow\)

Why not *\([\text{juafu}]\)\?*

Why does \(V_3\) have to be realized here?

and \([\text{omʔim}]\)

\[
\begin{array}{ccccccc}
\text{C} & \text{V} & \text{C} & \text{V} & \text{C} & \text{V} & \text{C} & \text{V} \\
\end{array}
\]

\(\Rightarrow\)

\(\Rightarrow\)
Solution

Clearly, the power of the /-u/ in (c) is “spent” on the radical /a/, and therefore cannot silence $V_3$. Why not *[ʃuaʃˀu]*?

c) $ʃ$ u a $ʃ$ a u
| | $\neq$ | | $\neq$ |
C V C V2 C V3 C V
Clearly, the power of the /-u/ in (c) is “spent” on the radical /a/, and therefore cannot silence V₃.

\[
/ʃuaʃa/ \Rightarrow [ʃuaʃe³u]
\]
This works nicely for [ʃuabdu], because here the power of the /-u/ is not spent on a “guttural” ghost.

/ʃuəʃəu/ => [ʃuaʃəu]
Solution

\[ [\text{om`im}], \ * [\text{ome`im}] \]

b) \[ \text{om a i m} \]

\[ C \ V \ C \ V_2 \ C \ V \ C \ V \]

But again it raises the question of why \( V_2 \) in (b) can be silenced...

\[ /\text{u`a}u/ \Rightarrow [\text{ua}e`u] \]

c) \[ \text{u a} \quad \text{e a u} \]

\[ C \ V \ C \ V_2 \ C \ V_3 \ C \ V \]
It must be that in (b), V₂ does not require inhibition in order to remain silent.

But again it raises the question of why V₂ in (b) can be silenced...

\[
\text{[om}^\text{im}], *\text{[ome}^\text{im}]
\]

b) \[
\begin{array}{ccccccccc}
\text{C} & \text{V} & \text{C} & \text{V}_2 & \text{C} & \text{V} & \text{C} & \text{V} \\
\end{array}
\]

\[
/\text{ju}^\text{a}\text{j}^\text{a}u/ \Rightarrow \text{[juae}^\text{u}]
\]

c) \[
\begin{array}{cccccccc}
\text{C} & \text{V} & \text{C} & \text{V}_2 & \text{C} & \text{V}_3 & \text{C} & \text{V} \\
\end{array}
\]
Solution

It must be that in (b), $V_2$ does not require inhibition in order to remain silent. But why?

But again it raises the question of why $V_2$ in (b) can be silenced...

\[
\text{[\text{o}m^2\text{i}m], *\text{[o}m\text{e}^2\text{i}m]}
\]

\[
\text{b) } \quad \text{[o}m\text{a}i\text{m}}
\]

\[
\text{[u}^a\text{a}u/} \Rightarrow \text{[u}a\text{e}^3\text{u]}
\]

\[
\text{c) } \quad \text{[u}a\text{a}u}
\]
Solution

It must be that in (b), V₂ does not require inhibition in order to remain silent. But why?

The answer has to do with the preceding /ua/ sequence.

\[
\text{b) } \text{ʃomˀim}, *\text{ʃomeˀim} \\
\text{c) } \text{ʃu a u} => \text{ʃuaʃeˀu} \\
\text{b) } \text{ʃom a i m} \\
\text{c) } \text{ʃua u} \\
\]
Solution

• Disclaimer: the solution that will be proposed now is not entirely in line with the general theory of CVCV phonology.

• Specifically, it depends on an additional layer of syllabic structure, that involves codas, whereas in CVCV all consonants are onsets.
Solution

• Recall our second question:

is [oa] in *moalim* a bisyllabic hiatus [o.a] or a monosyllabic diphthong [oa]?

▪ One thing we know about diphthongs is that, like long vowels, they do not like to be in closed syllables.
Solution

• Recall our second question:

is [oa] in *moalim* a bisyllabic hiatus [o.a] or a monosyllabic diphthong [oa]?

• One thing we know about diphthongs is that, like long vowels, they do not like to be in closed syllables.

We will now see that it is the diphthong parse that will give us the correct result.
Solution

- Codas
Solution

- A ban on two level branching, responsible for closed syllable shortening
Solution

- A ban on two level branching, responsible for the ungrammaticality of diphthongs before codas

```
*  O  R
|   |   |
N  |   |
| X |   |
X  | X  |
X  | X  |
X  | X  |
X  |   |
```

k i a t u
Let us assume that in order for a C to have a derived coda status, either the following consonantal position is licensed by a vowel, or the intervening V is governed.
in [ʃomˈim], the V₂ is not governed, because the vowel’s power is spent on the guttural ghost. But the following C is licensed, and so a derived coda may be formed.
In [ʃiabdu], however, a coda cannot be formed at all, because of the diphthong [ua]. \( V_3 \) still does not have to be realized, because it is governed.
In [ʃiaʃeu], too, a coda cannot be formed because of the diphthong [ua]. But in contrast to [ʃiabdu], V3 cannot be inhibited by /-u/, and therefore it must be realized.

Puzzle solved
Solution

▪ This solution relies crucially on the diphthong parse of the sequences created by unloaded guttural ghost /a/.

▪ This is a welcome result. Several scholars have argued for disyllabic word minimality of uninflected stems in IH, understood here as two realized nuclei. A hiatus parse of [ʃi.aʃe.a] violates this condition, a diphthong parse doesn’t.
However,

One must stress the price that has to be paid.

▪ Work in CVCV has claimed that all hierarchical syllable structure can be eliminated...

▪ Although the codas here are “derived” (not primitive) the coda-onset clusters argued for are not accepted by the general principles of the theory.
That said,

▪ I have not found a better explanation.

▪ The analysis sheds light on other issues in MH, a fact which lends it support.

(to be explored if there’s time, in separate PDF)
Class summary

- Today we’ve distanced ourselves from the root and template polemics and delved into another aspect that Semitic is famous for, gutturals.

- IH, like many other Afro-asiatic languages, no longer has gutturals. But like those other languages, it does retain many guttural effects. We asked how come.
Class summary

- We’ve explored the hypothesis that gutturals have been rehabilitated as a /a/ radical, which as such is initially mapped to a C-slot.

- In light of this, we looked at a specific puzzle of reduplicated biradical with a second guttural.
Class summary

- Roots are usually referred to as being “consonantal”. Today’s discussion qualifies this term: radicals are not necessarily consonants, but as radicals they are mapped to consonantal positions in tempaltes.

- Even though we’ve not discussed the non-concatenative polemic today, it is really hard to imagine what a non-templatic, word-based analysis would be of the issue we’ve looked at today.
Class summary

- This is a real challenge for such an approach – these verbs are not negligible at all in the language, and the processes are both productive and exceptionless.

- All that said, we’ve only looked at a couple of guttural effects. To close with a challenge, let us consider the following guttural-related data
the challenges of *ʰ

<table>
<thead>
<tr>
<th>Language</th>
<th>English Meaning</th>
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<tbody>
<tr>
<td>hifwɪχ</td>
<td>‘refute’</td>
</tr>
<tr>
<td>hetɪχ</td>
<td>‘weld’</td>
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<tr>
<td>tiveχ</td>
<td>‘mediate’</td>
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<tr>
<td>sibexχ</td>
<td>‘complexify’</td>
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<tr>
<td>hifwɪaχ</td>
<td>‘blow’</td>
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<td>hetɪaχ</td>
<td>‘hurl’</td>
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<tr>
<td>tiveaχ</td>
<td>‘give range’</td>
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<td>jibeaχ</td>
<td>‘praise’</td>
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the challenges of *\( h \)
the challenges of *顼

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<th>hifκίαχ</th>
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the challenges of *ṱ

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the challenges of *ṱ

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`s i b e a _χ` | `????`
the challenges of *Opacity

jaazɔʁ  ‘help’  jaγχɔʁ  ‘return’
maaviv  ‘pass’  maγχiv  ‘grow pale’
Course Summary

- Semitic languages exhibit real non-concatenativity: morphemes that are not suffixed, infixed or prefixed to their bases.

- This phenomenon is, as far as I know, unique to these languages.

- Like these morphemes, the bases are also discontinuous, and are a special type of “stem”...
Several scholars, famously but certainly not exclusively Outi Bat El, have argued that Semitic languages are not so different in fact.

In these languages, too, the basic storage unit is the word. They argued for this mainly because
- Roots are too underspecified in meaning
- in derivation, the target is sensitive to more than just a set of extracted consonants.
Subsequently, some aspects of the template morpheme were also under “attack”: the syllable structure, it was argued, can be derived phonologically. The template is in fact only its vowels.

We’ve gone over many arguments against these claims. While in many cases the proponents of the rootless approach can still appeal to the stem, there are crucial cases where they cannot, often related to weak verbs.
Course Summary

- We devoted an entire class to the question of biradical roots, reduplication and template satisfaction. While there are ways to derive the phenomena in a rootless approach, it was shown that they come with a cost.

- In addition, we saw that external evidence – psycholinguistic etc. - also argue for the existence of the root as a meaningful cognitive unit.
Course Summary

- Indeed, in many theories underpecified roots are a universal component of morphology, and what sets Semitic ones apart is mostly their internal structure.

- Finally, we examined from up close the case of the lost gutturals of IH, implementing all the machinery that we have acquired in the course. This phenomenon, too, relies on a modern interpretation of roots and templates as real cognitive objects.