

## Root-and-pattern morphology

For our final lecture, we look at the complexities that arise for the kind of non-concatenative root-and-pattern morphology found in the Semitic languages. This presents a similar problem to the one infixation did for our morphosyntactic theory: While it appears that words in these languages are composed of various subparts, they are not linearized one after the other, but interspersed amongst each other. We will build on our approach to infixation and reduplication to solve this problem.

### 1 Overview

- In the last two lectures, we focused on the problems presented by infixation and reduplication.
- On the accounts presented, both processes have a significant phonological component, referring to non-morphological and non-syntactic structures.
  - Infixation places infixes between segments and at various prosodic boundaries rather than at pre-existing morphological boundaries.
  - Reduplication utilizes morphemes whose exponents are prosodic TEMPLATES, morphemes with prosodic structure that lack underlying segmental material.
- Semitic root-and-pattern morphology requires us to build on both of these approaches.
  - Like infixation, this morphology is NON-CONCATENATIVE, but to an even more extreme degree. Two morphemes appear to become interspersed with each other.
  - The patterns of these interspersions varies depending on derivational and inflectional characteristics of these words, suggesting a templatic account similar to the one used for reduplication.

Such morphemes, as you may recall, are sometimes called TRANSFIXES.

(1) *Arabic verbs formed from the root* √ktb:

- |  |                                     |
|--|-------------------------------------|
| a. <i>kattaba</i><br>'he made someone write' | b. <i>kutiba</i><br>'it is written' |
|--|-------------------------------------|

<https://en.wikipedia.org/wiki/K-T-B>

- The discussion today centres on the properties of this kind of morphology, with an emphasis on verbs.
  - We'll first look at the properties of words derived in this fashion in Hebrew, Arabic, and Amharic.
  - We'll then look at the syntax underlying the verbs in these languages.
  - Finally, we'll look at an autosegmental phonological analysis that attempts to account for the patterns by the used of prosodic templates.

## 2 The data

- In this section we will go over what the morphology of verbs and nouns looks like in Arabic, Hebrew, and Amharic.
- In these languages, verbs can be broken down into (at least) three different morphemes.
  - i. A consonantal root, which contributes core, idiosyncratic lexical meaning.
  - ii. A VOCALIC MELODY (*i.e.*, vowels) that are related to the voice of the clause.
  - iii. A template that determines the order of consonants and vowels in the resulting word and which is associated argument structure.
- Despite our focus on verbs, noun and adjective formation relies on similar mechanisms.

The divisions here are based on the discussion in Arad (2005); this is slightly different from what Katamba (1993: 166) states; vowels have different contextual allophones in different tense/aspects. As is customary, I'm setting aside agreement affixes in much of this discussion, concentrating on verb stem formation.

### 2.1 Root-and-pattern morphology in Hebrew

- Arad (2003, 2005) takes roots to be atomic elements devoid of syntactic or functional material, which matches the traditional definition of root most morphologists assume.
- These are arranged into patterns called *BINYANIM* (sg. *binyan*).
- In some cases, the meanings are transparent. Many words derived from the root  $\sqrt{\text{šmn}}$  have a meaning related to fat:

(2) *Words derived from  $\sqrt{\text{šmn}}$  (Arad 2003: 742):*

Category	Binyan	Form	Gloss
Verb	a. hiCCeC	<i>hišmin</i>	'grow fat/fatten'
Noun	b. CeCeC	<i>šemen</i>	'oil/grease'
	c. CuCaC	<i>šuman</i>	'fat'
	d. CuCaC	<i>šimen</i>	'grease'
	e. CaCCeC	<i>šamenet</i>	'cream'
Adjective	f. CaCeC	<i>šamen</i>	'fat'

Though some patterns display geminate consonants, there are no geminates in Modern Hebrew (though there were in Biblical Hebrew). However, there are four-consonant roots that use these *binyan*, hence the double-Cs.

- But the meanings are not always transparent. Though it may be possible to see some semantic connection, what the connection is could be quite vague:

(3) *Words derived from  $\sqrt{\text{bxn}}$  (Arad 2003: 743):*

Category	Binyan	Form	Gloss
Verb	a. CaCaC	<i>baxan</i>	'test, examine'
	b. hiCCiC	<i>hivxin</i>	'discern'
Noun	c. miCCaC	<i>mivxan</i>	'an exam'
	d. CoCaC	<i>boxan</i>	'a quiz'
	e. maCCeCa	<i>mavxena</i>	'a test-tube'
	f. aCCaCa	<i>avxana</i>	'a diagnosis'

There is a phonological alternation between [b] and [v] in these examples.

- In (3) it seems as though  $\sqrt{bxn}$  acquires two different meanings as verbs, and Hebrew speakers must acquire the two interpretations that this root has.
- It has a number of apparently related but specialized meanings when it is a noun.
- So, to some extent, roots must be underspecified in their meanings.
  - If roots occur only in the contexts of the different words derived from them, it is difficult to access the semantic core of the root.
  - When we put together the words made from the same root, we might be able to extract some semantic core shared by them
- There are a couple of important things to see here, related to issues we've seen in this course.
  - The same root can occur in words of different categories. For instance,  $\sqrt{šmn}$  can occur in adjectives, nouns, and verbs.
  - The thing that determines the category of a word is the *binyan*. Consonantal roots are not restricted to any particular category.
  - The idiosyncrasy of the meanings is similar to other derivational morphological processes we've seen (*cf.*, *reality*, *realist*, *realize*, *really*).
- Indeed, as Arad (2003) discusses at length, words formed by this process can serve as the input to further morphological derivation.
  - For instance, it is possible to use  $\sqrt{sgr}$  to derive both nouns and verbs:

This is related to the idea from Marantz (1997) that elements like roots only receive their meanings in context. In some sense, under DM, all words are idioms.

(4) *Words derived from  $\sqrt{sgr}$  (Arad 2003: 746):*

Category	Binyan	Form	Gloss
Verb	a. CaCaC	<u>s</u> <u>g</u> <u>a</u> <u>r</u>	'close'
	b. hiCCiC	<u>h</u> <u>i</u> <u>s</u> <u>g</u> <u>i</u> <u>r</u>	'extradite'
	c. hitCaCCeC	<u>h</u> <u>i</u> <u>s</u> <u>t</u> <u>a</u> <u>g</u> <u>e</u> <u>r</u>	'cocoon oneself'
Noun	d. CeCeC	<u>s</u> <u>e</u> <u>g</u> <u>e</u> <u>r</u>	'closure'
	e. CoCCayim	<u>s</u> <u>o</u> <u>g</u> <u>r</u> <u>a</u> <u>y</u> <u>i</u> <u>m</u>	'parenthesis'
	f. miCCeCet	<u>m</u> <u>i</u> <u>s</u> <u>g</u> <u>e</u> <u>r</u> <u>e</u> <u>t</u>	'frame'

Check out the metathesis in this form; *cf.* McCarthy 1979: 228.

- It is possible to take the noun (4f) *misgeret* 'frame', and derive a verb from it, using a *binyan* with four consonants:

(5) *Verb derived from noun misgeret (Arad 2003: 746):*

Category	Binyan	Form	Gloss
Noun	miCCeCet	<u>m</u> <u>i</u> <u>s</u> <u>g</u> <u>e</u> <u>r</u> <u>e</u> <u>t</u>	'frame'
Verb	CiCCeC	<u>m</u> <u>i</u> <u>s</u> <u>g</u> <u>e</u> <u>r</u>	'to frame'
	CuCCaC	<u>m</u> <u>i</u> <u>s</u> <u>g</u> <u>a</u> <u>r</u>	'to be framed'

- The resulting verb has the same root as the noun ( $\sqrt{sgr}$ ), but it isn't being derived directly from the root; it has several properties of the noun:
  - The verb has the meaning of 'frame' derived in the original noun.
  - The morphology contains the initial [m] segment from the prefix in the *miCCeCet* binyan, treating it as if it were another root consonant.
  - The vowels of the the vocalic melody are those of the the verbal paradigm.
- So this has properties of a derivational process – namely, category changing, and idiosyncratic meaning.
- However, this system plays a role in determining verbal paradigms as well.

Arad notes there is no explanation for why the suffix *-et* is lost.

This is most evident in the passive form *musgar* 'be framed'.

(6) *Hebrew binyan with roots  $\sqrt{\text{ʕmd}}$  and  $\sqrt{\text{qpl}}$  (Arad 2003: 742):*

	<b>Binyan</b>	<b>Root</b>	<b>Verb</b>	<b>Gloss</b>
1	CaCaC	$\sqrt{\text{ʕmd}}$	<i>ʕamad</i>	'be standing'
2	niCCaC	$\sqrt{\text{ʕmd}}$	<i>neʕamad</i>	'stand up'
3	CiCCeC	$\sqrt{\text{qpl}}$	<i>qipel</i>	'fold' (trans.)
4	CuCCaC	$\sqrt{\text{qpl}}$	<i>qupal</i>	Passive of 3
5	hiCCiC	$\sqrt{\text{ʕmd}}$	<i>heʕemid</i>	'make stand up'
6	huCCaC	$\sqrt{\text{ʕmd}}$	<i>huʕamad</i>	Passive of 5
7	hitCaCCeC	$\sqrt{\text{qpl}}$	<i>hitqapel</i>	'fold' (intr.)

- Different *binyanim* result in different forms of the 'same' verb.
- Notice, too, that the primary difference between *binyanim* 3 and 4, on the one hand, and 5 and 6 on the other is the vowels.
- Here is one more (unfortunately incomplete) paradigm, with only one root:

(7) *Paradigm with  $\sqrt{\text{gdl}}$  (Ussishkin 2003):*

	<b>Binyan</b>	<b>Verb</b>	<b>Gloss</b>
1	CaCaC	<i>gadal</i>	'he grew' (intr)
3	CiCCeC	<i>gidel</i>	'he raised'
4	CuCCaC	<i>gudal</i>	'he was raised'
5	hiCCiC	<i>higdil</i>	'he enlarged'
6	huCCaC	<i>hugdäl</i>	'he was enlarged'

- Again, we see a characteristic (though somewhat opaque) semantic relation between elements derived from the same root.
- However, these are all verbs, and information like active *vs.* passive is encoded in these different forms.

## 2.2 Root-and-pattern morphology in Arabic

- As can be seen in the chart below, Arabic words are also based on consonantal roots arranged into different templates.

(8) *Arabic words derived from √ktb* (Tucker 2011: 178):

Category		Template	Form	Meaning
<b>Verb</b>	a.	CaCaCa	<u>kataba</u>	'he wrote'
	b.	CaCCaCa	<u>kattaba</u>	'he made someone write'
	c.	nCaCaCa	<u>nkataba</u>	'he subscribed'
	d.	CtaCaCa	<u>ktataba</u>	'he copied'
<b>Noun</b>	e.	CiCaaC	<u>kitaab</u>	'book'
	f.	CuCCaaC	<u>kuttaab</u>	'Koranic school'
	g.	CuCayyiC	<u>kutayyib</u>	'booklet'
	h.	maCCaCa	<u>maktaba</u>	'library, bookstore'
	g.	muCaaCiC	<u>mukaatib</u>	'correspondent, reporter'

This is very similar to the list given by Katamba (1993: 164). Much of the from Tucker and Katamba (1993) ultimately come from McCarthy (1979, 1981).

- As in Hebrew, the same root may appear in both nouns and verbs.
- There is some degree of idiosyncratic meaning here (*cf.* *kuttaab* 'Koranic school' and *mukaatib* 'reporter').
- Also, as in the Hebrew examples, the difference between active and passive verbs in many paradigms is the vowels (though there are more patterns here).

(9) *Perfective active and passive paradigms of fʕl*, "doing, action":

Cited in Tucker (2011: 180)

	Template	Form		Template	Form
I	C <sub>1</sub> aC <sub>2</sub> aC <sub>3</sub>	faʕal	I	C <sub>1</sub> uC <sub>2</sub> iC <sub>3</sub>	fuʕil
II	C <sub>1</sub> aC <sub>2</sub> C <sub>2</sub> aC <sub>3</sub>	faʕʕal	II	C <sub>1</sub> uC <sub>2</sub> C <sub>2</sub> iC <sub>3</sub>	fuʕʕil
III	C <sub>1</sub> aaC <sub>2</sub> aC <sub>3</sub>	faaʕal	III	C <sub>1</sub> uuC <sub>2</sub> iC <sub>3</sub>	fuuʕil
IV	?aC <sub>1</sub> C <sub>2</sub> aC <sub>3</sub>	?afʕal	IV	?uC <sub>1</sub> C <sub>2</sub> iC <sub>3</sub>	?ufʕil
V	taC <sub>1</sub> aC <sub>2</sub> C <sub>2</sub> aC <sub>3</sub>	tafaʕʕal	V	tuC <sub>1</sub> uC <sub>2</sub> C <sub>2</sub> iC <sub>3</sub>	tufuʕʕil
VI	taC <sub>1</sub> aaC <sub>2</sub> aC <sub>3</sub>	tafaaʕal	VI	tuC <sub>1</sub> uuC <sub>2</sub> iC <sub>3</sub>	tufuuʕil
VII	nC <sub>1</sub> aC <sub>2</sub> aC <sub>3</sub>	nfaʕal	VII	n/a	
VIII	C <sub>1</sub> taC <sub>2</sub> aC <sub>3</sub>	ftaʕal	VIII	C <sub>1</sub> tiC <sub>2</sub> iC <sub>3</sub>	ftiʕil
IX	C <sub>1</sub> C <sub>2</sub> aC <sub>3</sub> C <sub>3</sub>	fʕall	IX	n/a	
X	staC <sub>1</sub> C <sub>2</sub> aC <sub>3</sub>	staffal	X	stuC <sub>1</sub> C <sub>2</sub> iC <sub>3</sub>	stuffil
Q1	C <sub>1</sub> aC <sub>2</sub> aC <sub>3</sub> aC <sub>4</sub>	faʕalal			
Q2	taC <sub>1</sub> aC <sub>2</sub> C <sub>3</sub> aC <sub>4</sub>	tafaʕlal			

- So again, just as in Hebrew, part of the inflectional system is based in root-and-pattern morphology as well, not just derivational morphology.
- Notice here, though, that the distinction between voice (*i.e.*, the choice of vowels) is much more transparent.

- It is worth pointing out, too (though we will not talk about it as much) that Arabic verbs take suffixes to express agreement

(10) *Inflection of Perfective Verbs Exemplified in Form I:*

Person	Gender	Singular	Plural
1	—	faʕal-tu	faʕal-naa
2	<b>Masc</b>	faʕal-ta	faʕal-tum
	<b>Fem</b>	faʕal-ti	faʕal-tunna
3	<b>Masc</b>	faʕal-a	faʕal-uu
	<b>Fem</b>	faʕal-at	faʕal-na

Suffixes are the same across all perfective forms. Circumfixes are used in the imperfective forms.

Most of the verbs from Katamba, discussed below, are 3rd person singular masculine and bear the *-a* suffix.

- These can be treated just like suffixes in any other language; there won't be much interesting to say about them.

### 2.3 Other Semitic languages

- There are many other Semitic languages (including Amharic, Tigrinya, Maltese, and Aramaic) whose root-and-pattern systems have received far less attention in the theoretical literature.
- These languages, too, display similar behaviour to Hebrew and Arabic. This can be seen in Amharic (Ethiopia):

(11) *Amharic words formed from  $\sqrt{\text{brk}}$  and  $\sqrt{\text{lbs}}$ :*

Root	Template	Form	Gloss
$\sqrt{\text{brk}}$	$C_1\text{ä}C_2C_2\text{ä}C_3\text{ä}$	<i>bärräkä</i>	'lighten; thunder' (v.)
	$C_1C_2\text{ä}C_3$	<i>mä-bräk'</i>	'lightening, thunder' (n.)
	$C_1aC_2C_2\text{ä}C_3\text{ä}$	<i>barräkä</i>	'go off accidentally (gun)'
	$C_1C_2C_3$	<i>brk'</i>	'scarce, rare, precious'
	$C_1C_2\text{ä}C_3\text{ä}C_3C_2C_2\text{ä}C_3\text{ä}$	<i>t-bräkärräkä</i>	'glitter'
$\sqrt{\text{lbs}}$	$C_1\text{ä}C_2C_2\text{ä}C_3\text{ä}$	<i>läbbäsä</i>	'wear'
	$C_1iC_2C_3$	<i>libs</i>	'clothing'
	$C_1iC_2aC_3$	<i>libas</i>	'cover'

Data from Ayalew 2013: 8 and Kramer 2009: 157.

This sure looks like internal reduplication for pluractionality.

- There is some work on the morphosyntax of other Semitic languages (see Kramer 2009 on Amharic and Tucker 2013 on Maltese), but I couldn't find much on the root-and-pattern morphology outside Arabic and Hebrew.

### 2.4 Theoretical issues

- If we want to account for this sort of morphological phenomenon under our current understanding, we need to address several issues.
  - If morphemes are heads, as we have been assuming, what heads correspond to which parts of the Semitic word?
  - Since the morphology is non-concatenative, how do we explain how each morpheme comes to be interspersed among the others?

### 3 The syntactic derivation of Semitic verbs

- Most discussions in the literature pay the most attention to how verbs are derived, so we'll concentrate on that here.
- We'll start by looking at the syntactic structure of the verbs before turning to issues having to do with the morphophonology.
  - We can map each of the subcomponents of the Semitic verb onto a different head in the syntax.
  - Prosodic morphology of the type we used to explain reduplication will allow us to explain how these pieces are put together.

#### 3.1 Deriving verbs in the syntax

- We saw above that we can break Hebrew and Arabic verbs up into three subparts:
  - i. A consonantal root that contributes idiosyncratic semantic information.
  - ii. A vocalic melody that represents information about voice.
  - iii. A pattern of consonants and vowels that is related to argument structure and syntactic category.
- We can see each of these at work in Hebrew verbs formed from  $\sqrt{qpl}$ .

(12) *Hebrew verbs derived from  $\sqrt{qpl}$ :*

Binyan	Verb	Gloss
CiCCeC	qipel	'fold' (transitive)
CuCCaC	qupal	'be folded' (passive)

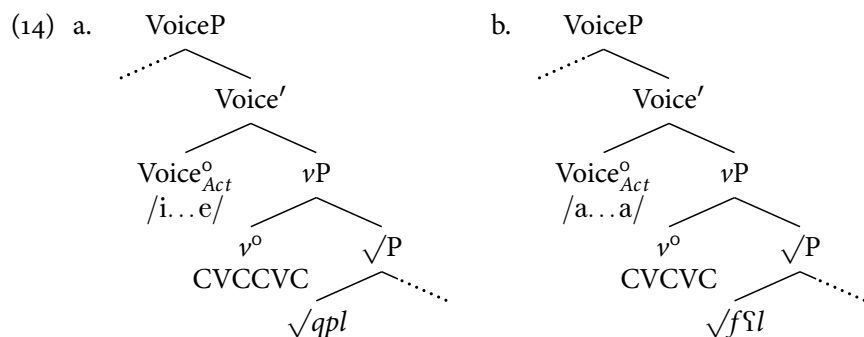
- The root  $\sqrt{qpl}$  contributes the meaning 'fold'.
- The template CVCCVC is used for agentive verbs.
- The vowels /i...e/ is used for actives, while /u...a/ are used for passives.
- Similar observations come from the Arabic data we saw in (8) and (9):

(13) *Arabic verbs derived from  $\sqrt{f\text{ʕ}l}$ :*

Template	Verb	Gloss
CaCaC	<i>faʕala</i>	'he does'
CuCiC	<i>fuʕila</i>	'it is done'

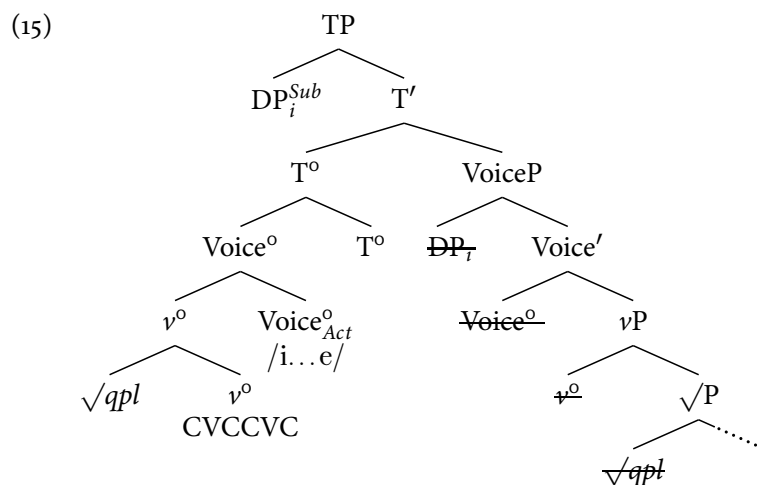
- Here the template and root remain the same; only the vocalic melody changes, affecting the voice of the verb.
- In fact, it's clearer in Arabic that the consonants, vowels, and template act independently of one another, since the templates aren't tied to the vowels in the same way as they are in Hebrew.

- Arad (2005: 45) uses these correlations to argue for the following correlations which Tucker (2011) adopts for Arabic as well.
  - The Semitic root corresponds to the DM notion of root.
  - The vocalic melody corresponds to Voice<sup>o</sup>.
  - The pattern is a template corresponding to the verbalizing head v<sup>o</sup>.
- Thus, the underlying structure for a verb like Hebrew *qipel* ‘fold’ or Arabic *faʕal* ‘did’ (ignoring tense and agreement morphology) might look as follows:



- It is generally thought that verbs move to T<sup>o</sup> in Hebrew.
  - This means that these elements will all undergo head movement to T<sup>o</sup> where they will be placed adjacent to tense and agreement morphology.

This dates back at least to Doron 1990.



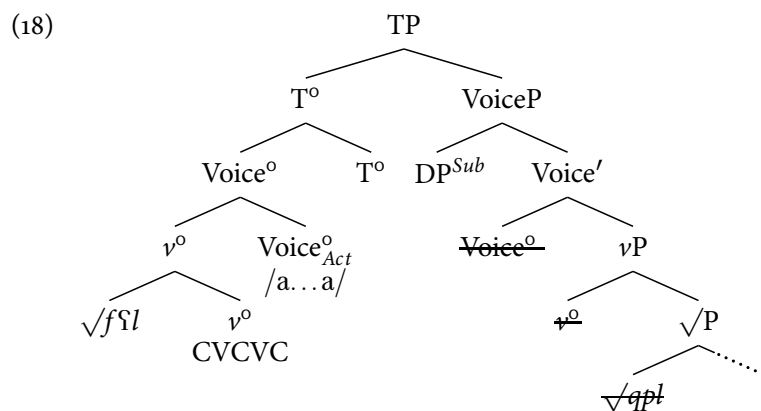
- Because these elements are all grouped together under T<sup>o</sup>, they will be treated together as a word by the phonology (they are all in a single M-word).
- Arad (2005: 43) explains that the various changes in the vocalic melody changes in active verbs with different templates can be explained by analyzing them as exponents of contextually specified Vocabulary Items:



- (16) *Vocabulary of active Voice<sup>o</sup>*:
- a. Voice[ACT] ↔ /a...a/ / CVCVCV \_\_
  - b. Voice[ACT] ↔ /i...a/ / nVCCVCV \_\_
  - c. Voice[ACT] ↔ /i...e/ / CVCCVCV \_\_
  - d. Voice[ACT] ↔ /i...i/ / hVCCVCV \_\_
  - e. Voice[ACT] ↔ /a...e/ / hitCVCCVCV \_\_
- (17) *Vocabulary of passive Voice<sup>o</sup>*:
- a. Voice[PASS] ↔ /u...a/ / CVCCVCV, hVCCVCV \_\_
  - b. Voice[PASS] ↔ niCCaC / CVCVCV \_\_

- The pattern inserted in  $v^o$  is presumably determined by features on  $v^o$  along with what root it co-occurs with.
- Verb movement in Arabic is a bit more complex due to the interaction of auxiliaries with vso and svo word orders (see Tucker 2011: 184–191).
  - For now, we can limit ourselves to assuming that the verb moves to  $T^o$ .
  - vso orders occur when the subject remains in SpecVoiceP.

Unfortunately, Arad does not say what these features are or would be, though to her credit this is not what the central goal of her work is. Given what we have seen so far, the relevant features may be transitivity and causativity, though pinning down the exact meaning of each *binyan* remains difficult.



### 3.2 Brief aside on deriving verbs from nouns

- Recall, too, that verbs can be derived from nouns:
- The root  $\sqrt{sgr}$  has a number of possible interpretations:

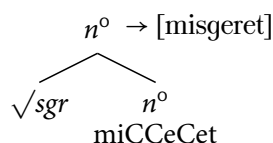
(19) *Words derived from  $\sqrt{sgr}$* :

Category	Binyan	Form	Gloss
<b>Noun</b>	miCCeCet	<i>misgeret</i>	‘frame’
<b>Verb</b>	CiCCeC	<i>misger</i>	‘to frame’
	CuCCaC	<i>musgar</i>	‘to be framed’

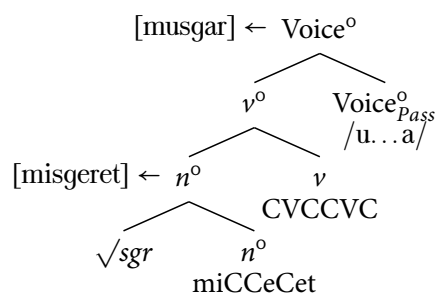
- We can use the same sort of derivational processes that we have assumed all along to create an appropriate structure.

- The noun *misgeret* ‘frame’ can be formed by combining the root  $\sqrt{sgr}$  with an appropriate  $n^{\circ}$ .
- The verbs can be derived by combining this  $n^{\circ}$  with verbal material.

(20) a. Noun formation:



b. Verb formation from a noun:



- However, as far as I know, there is no analysis of the morphophonology of these sorts of verbalizations. Things to wonder about in the coming discussion:
  - Why does the /m/ segment get preserved rather than the /t/?
  - What happens to the vowels in the noun? Do they get overwritten? How?
  - Why doesn't the template act more like a reduplicant morpheme? Why should the consonants in the noun get remapped to the new template?

This might get a partial answer in some of the OT-based work on Semitic morphology; see Ussishkin (2000, 2003).

#### 4 The morphophonology of Semitic verbs

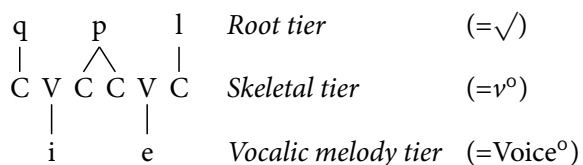
- Under the syntactic derivation above, the root, template, and vowels are each separate morphemes.
- Under our current assumptions about morpheme linearization, we end up deriving nonsensical linearization statements:

(21) a.  $\sqrt{qpl} \wedge \text{CVCCVC}$       b.  $\text{CVCCVC} \wedge /i\dots e/$

- Notice how similar this is to the linearization statements we derive when we try to derive reduplication in our syntactic system.
- However, the same system that let us understand reduplication gives us a way of accounting for root-and-pattern morphology as well.
- Work in Autosegmental Phonology, starting with McCarthy (1979), proposed that each morpheme could be associated with a different tier:

See the example of O'dham on page 8 of the lecture notes on reduplication [↗](#).

(22) *The morphology of qipel ‘folded’ (Hebrew), following McCarthy (1979):*



- $v^o$  introduces a template, just like reduplicant morphemes do.
- The slots in this template must come to be associated with material in the root and the vocalic melody.

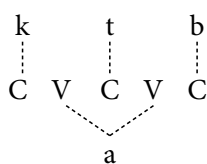
- So now let’s look at how this happens.

#### 4.1 Association

- Let us go through the example of Arabic *kataba* ‘he wrote’, discussed by Katamba (1993: 165–167).
- In a simple case like this, the underlying template is CVCVC.
  - Consonants from the root tier associate with each C slot from left to right.
  - Under Autosegmental Phonology, it is widely assumed that two adjacent identical segments are often disallowed (under the OBLIGATORY CONTOUR PRINCIPLE).
  - It follows that there is only one underlying vowel /a/ that spreads to each vowel position.

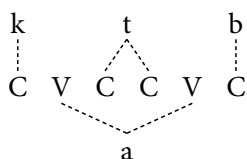
The final vowel in the form is actually an agreement affix. We’ll come to those below.

(23) *The morphology of perfective stem katab- ‘wrote’ (Arabic):*



- In cases like (22) above, we must also assume that consonants have the ability to spread to fill empty C slots:

(24) *The morphology of causative perfective kattab- ‘caused to write’ (Arabic):*

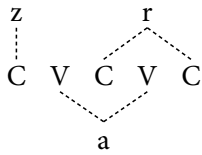


- Here, it must be possible for /t/ to be associated with the middle two C-slots in the template.
- In fact, such spreading appears even in templates without geminate consonants. There are roots with only two consonants, like *zr* ‘pull’, and in these the second consonant spreads to all remaining C slots:

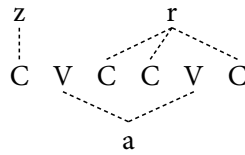
It is worth noting that this spreading rule needs to be language-specific. Some languages with similar morphology do not show this spreading, and as we saw with reduplication, a single vowel does not fill every available spot in most languages.

It is worth contemplating why this spreading occurs. One could imagine other forms, like *\*kaktab* or *\*katbab*, or *\*zazrara*, as McCarthy (1979: 249–250) does. He ultimately (p. 255–257) states that *\*katbab* is formed but a rule goes back and erases the association line between /b/ and the third consonant slot.

(25) a. *zarar-* ‘pulled’:

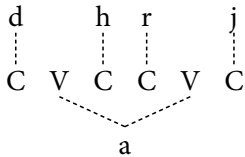


b. *zarrar-* ‘caused to pull’:



- It is also worth pointing out that quadrilateral roots (those with four consonants) also exist, and they use b

(26) *dahraj-* ‘caused to roll’:



#### 4.2 Infixation in Arabic

- As you may have noticed, Arabic template VIII contains an infix /t/:

(27) *Templates I and VIII:*

	Template	Active	Passive
I	C <sub>1</sub> aC <sub>2</sub> aC <sub>3</sub>	faʕal	fuʕil
VIII	C <sub>1</sub> taC <sub>2</sub> aC <sub>3</sub>	ftaʕal	ftiʕil

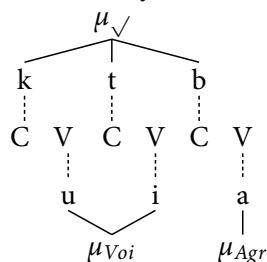
- This is apparently some sort of reflexive marker, as can be seen in the following Syrian Arabic examples:

(28) *Reflexive infixation in Arabic:*

Root	Form	Gloss
smʕ	<i>samiʕa</i>	‘hear something’
	<i>stamaʕa</i>	‘hear oneself (listen)’
rfʕ	<i>rafaʕa</i>	‘lift something’
	<i>rtafaʕa</i>	‘lift oneself’

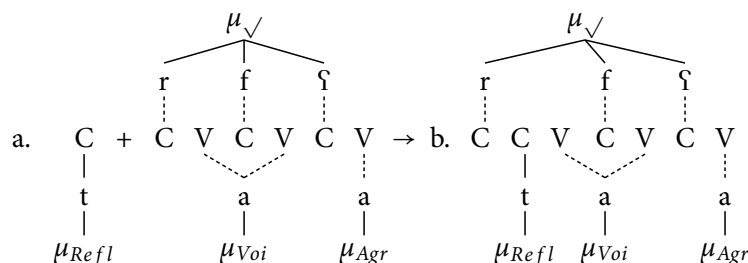
- The question is how to incorporate this element into the templatic root-and-paradigm approach used here.
- Following McCarthy (1981), we can further incorporate morpheme tiers into our representations, showing which

(29) Structure of kutiba ‘it was written’:



- Notice that this gives us a way to add the requisite agreement suffix to the representation!
- If we assume that the reflexive morpheme is a morpheme of its own, then it /t/ will be totally independent of the root, melody, and template.
  - This means it will be added to the representation with its own  $\mu$  node and consonant slot.
  - When this affix is next to the verb, it undergoes infixation. There is no need for association lines to cross.

(30) Derivation of rtafaʕa ‘he lifted himself’:



- We need only assume an infixation rule of the sort we’ve used previously:

(31) /t/ → [<sub>wd</sub> C-t-V ... / \_\_\_ + [<sub>wd</sub> CV...

cf. McCarthy 1979: 252.

### 4.3 Beyond the template

- Saying that there is a single morpheme that introduces the template has come under criticism.
  - A look over most of the templates we’ve seen reveals is they tend toward having CV(C) syllables.
  - The Hebrew forms, in fact, are largely bi-syllabic.
- This has led some people working in theories like OT, specifically Ussishkin (2000, 2003), to suggest that the template isn’t real.
- The reason for this is that the patterns imposed by the templates can be made to fall out from general principles about how phonology likes to organize consonants and vowels, and what kinds of prosodic structures are permissible.

- Tucker (2010, 2011) takes a very interesting take on this approach.
  - Basically, if you take a bunch of consonants and a bunch of vowels, the only way the phonology would want to arrange them is by interspersing them.
  - Thus, if you give the phonology  $C_1C_2C_3 + V_1V_2$ , it's gonna wanna spit out  $C_1V_1C_2V_2C_3$ .
- For those who can appreciate an OT analysis, he proposes:

(32) FAITH: A cover constraint for:      (33) \*COMPLEX: A cover constraint for:

- |                           |  |
|---------------------------|--|
| a. MAX:<br>No deletion.   | a. *COMPLEX <sup>ons</sup> :<br>No complex onsets. |
| b. DEP:<br>No epenthesis. | b. *COMPLEX <sup>cod</sup> :<br>No complex codas.  |

(34) INTEG(RITY):  
A segment in the output has a single correspondent in the input.

(35) CONTIG(UITY):  
The portion of the input and output strings standing in correspondence forms a continuous string.

McCarthy and Prince 1995

- These can derive Arabic Template I:

But see also Tucker 2010 for other templates.

(36) *Verb stems in template I:*

/fʕl/ + /a/	FAITH	*COMPLEX	INTEG.	CONTIG.
☞ a. faʕal			*	**
b. faʕl		*!		*
c. fʕal		*!		*
d. ʕal	*!			*

- We have to split up the root, violating CONTIGUITY.
- We also must duplicate the input vowel, violating INTEGRITY.
- But this is better than having complex onsets or codas, or deleting input material.

## Terms

**nonconcatenative morphology** A form of word formation that does not involve stringing morphemes together sequentially.

**root** The core of a (lexical) word.

**root** In traditional morphology, the irreducible core of a word, with absolutely no other morphological elements attached to it

(Katamba and Stonham 2006). The core meaning of the word is usually associated with this element.

**template** A series of CV-slots on a skeletal tier introduced by some morphemes.

**transfix** A discontinuous affix interspersed in its base.

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