

Nonconcatenative Morphology with Concatenative Syntax*

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1. Introduction

The “root-and-pattern” makeup of Semitic verbs has posed a long-standing puzzle for morphologists: the interpretation of a given root in a given template is difficult to predict, so the correlation between the morphophonological form (the template) and the syntax/semantics of the verb (its argument structure) is not transparent. As a result, it is unclear what the structure of the verb actually is and how the phonology and semantics interact. This paper addresses these questions by probing argument structure alternations in Hebrew.

I suggest a syntactic treatment of Hebrew in which verbal templates are the spell-out of functional heads familiar from contemporary syntactic technology. Templates are then taken to be the phonological spell-out of a specific Vocabulary Item in the sense of Halle and Marantz (1993). This approach results in a new understanding of the Hebrew system, shedding light on the architecture of argument structure alternations. It also motivates a structural view of morphology in which phonology and semantics are fed by the syntax. The mapping from phonology to semantics will be more transparent as a consequence.

I will motivate a distinction between the heads Voice and *v* and propose an ontology of these heads: different Voice heads manipulate the introduction of elements in the syntax, and different *v* heads manipulate the kind of event that is introduced. Semitic languages provide an ideal testing ground for the combinatorics of various functional heads in the verbal domain. I argue that when these functional elements carry certain features they are overt in Hebrew, spelled out cyclically and giving rise to the different templates.

2. The Data

The verbal system of Modern Hebrew is nonconcatenative, consisting of seven phonological “templates”, each identified by a distinct set of prefixes/infixes and vocalic patterns. A consonantal root, usually trilateral and notated here as \sqrt{XYZ} , can be instantiated in one or

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more templates. For example, Table 1 gives the finite 3rd person masculine forms of the root $\sqrt{\text{PKD}}$, with the root consonants capitalized.¹ These forms are all related to some basic notion of “counting” or “surveying”.

Template	Mnemonic	Gloss	Past	Present	Future
1 XaYaZ	simple	‘count’	<i>PaKaD</i>	<i>PoKeD</i>	<i>yiFKoD</i>
2 niXYaZ	middle	‘be absent’	<i>niFKaD</i>	<i>niFKaD</i>	<i>yiPaKeD</i>
3 XiYYeZ	intensive	‘command’	<i>PiKeD</i>	<i>meFaKeD</i>	<i>yeFaKeD</i>
4 XuYYaZ	intensive passive	‘be commanded’	<i>PuKaD</i>	<i>meFuKaD</i>	<i>yeFuKaD</i>
5 hiXYiZ	causative	‘deposit’	<i>hiFKiD</i>	<i>maFKiD</i>	<i>yaFKiD</i>
6 huXYaZ	causative passive	‘be deposited’	<i>huFKaD</i>	<i>muFKaD</i>	<i>yuFKaD</i>
7 hitXaYYeZ	middle intensive	‘ally himself’	<i>hitPaKeD</i>	<i>mitPaKeD</i>	<i>yitPaKeD</i>

Table 1: Finite forms in the Hebrew verbal system.

A number of points are important to note. First, most roots only exist in a few templates; the root $\sqrt{\text{PKD}}$ is unusual in that it is instantiated in all seven. Second, the interpretation of a given root in a given template is unpredictable. There is no obvious way in which a root can mean ‘command’ in one template and ‘deposit’ in another, nor is it obvious what the meaning alternations between these two templates would be like for another root. While each template may have a typical interpretation, this interpretation is not always constant. For example, verbs in the “causative” template are usually transitive and often causative, but a few roots instantiate unaccusative “causative” verbs (as discussed in Section 3.3). The sole exception to this generalization is the two passive templates which are always passive (rows 4 and 6 in Table 1). Doron (2003) and Arad (2005) discuss the constants and idiosyncrasies of the Hebrew system in detail. Third, the form of a root across tenses and Φ -feature combinations is for the most part predictable for a given template. For the “intensive” XiYYeZ, the paradigm is as in Table 2:

	Past		Present		Future	
	M	F	M	F	M	F
1SG	XiYYaZ-ti		me-XaYYeZ	me-XaYYeZ-et	a-XaYYeZ/ye-XaYYeZ	
1PL	XiYYaZ-nu		me-XaYYZ-im	me-XaYYZ-ot	ne-XaYYeZ	
2SG	XiYYaZ-ta	XiYYaZ-t	me-XaYYeZ	me-XaYYeZ-et	te-XaYYeZ	te-XaYYZ-i
2PL	XiYYaZ-tem	XiYYaZ-ten/m	me-XaYYZ-im	me-XaYYZ-ot	te-XaYYZ-u	
3SG	XiYYeZ	XiYYZ-a	me-XaYYeZ	me-XaYYeZ-et	ye-XaYYeZ	te-XaYYeZ
3PL	XiYYZ-u		me-XaYYZ-im	me-XaYYZ-ot	ye-XaYYZ-u	

Table 2: Tense and agreement marking in the “intensive” template.

Descriptively, each cell of the paradigm consists of between zero and two affixes, as well as vowel changes to the stem. Halle (1997) provides an account in which the prefix *ye-*,

¹A “YY” sequence denotes bleeding of an otherwise regular intervocalic spirantization process. This de-spirantization is a reflex of gemination in the classical language (Adam 2002).

for example, is a [-participant] prefix. Harbour (2008) refines this to [-author -participant]. These forms can thus be decomposed, but since the exact form of tense and agreement is predictable within a given template, I will abstract away from the exact phonological form.² Instead, I will use placeholder Vocabulary Items such as INTNS, which can be taken as shorthand for the relevant affixes, vowels and metrical alternations.

(1) Pronunciations of the Vocabulary Item INTNS:³

- a. XiYYeZ / ___ Past, 3SG.M
- b. XiYYZa / ___ Past, 3SG.F
- c. te-XaYYeZ / ___ Future, 2SG.M
- d. te-XaYYZ-i / ___ Future, 2SG.F
- (etc.)

The VI INTNS can also be taken as a set of realizational rules such as those developed by Faust (2012). The puzzle addressed in this paper lies not in how to realize tense and agreement in a template but in how these templates are derived in the first place. We will see next that there are certain argument structure alternations that hold in specific templates, and others that do not. Deriving these alternations will yield the correct phonological forms.

2.1 Attested and Unattested Mappings

Take the root $\sqrt{\text{SGR}}$ in (2), which has to do with a general notion of “closing”. In the “simple” template XaYaZ it is transitive, in the “causative” template hiXYiZ it is transitive and in the “middle” template niXYaZ it is nonactive (anticausative or passive).

- (2)
- a. *SaGaR*
closed.SMPL
 - b. *hiSGiR*
turned.in.CAUS
 - c. *niSGaR*
closed.MID (anticausative or passive, depending on context)

Generally speaking, if a root is instantiated in both the “simple” and the “causative” templates, then the “causative” verb will be transitive. If a verb exists in the “simple” and “middle” templates, then the latter will have a passive reading of the former. See Arad (2005) and Doron (2003, 2013b) for a detailed rundown of these patterns. I summarize the existing alternations in Table 3. I will derive the templates in a way that constrains whether a verb in a given template may be unaccusative, unergative and/or transitive. Unaccusative

²The phonology of some “weak”, “hollow” or “defective” bilateral roots is often non-transparent and requires positing a richer underlying representation.

³Abbreviations used in this paper: CAUS “causative” template, F feminine, INTNS “intensive” template, M masculine, MID “middle” template, PASS passive, PL plural, SG singular, SMPL “simple” template, $\sqrt{\text{XYZ}}$ the Root picked out by consonants XYZ.

Template		Alternation	Examples
Simple	<i>XaYaZ</i>	unaccusative unergative transitive	<i>nafal</i> ‘fell’, <i>karas</i> ‘collapsed’ <i>halax</i> ‘walked’, <i>kafac</i> ‘jumped’ <i>tafas</i> ‘caught’, <i>natan</i> ‘gave’
Intensive	<i>XiYYeZ</i>	unergative transitive	<i>tipes</i> ‘climbed’, <i>kipek</i> ‘hopped around’ <i>bišel</i> ‘cooked’, <i>yicer</i> ‘manufactured’
Causative	<i>hiXYiZ</i>	unaccusative unergative transitive	<i>hilbin</i> ‘whitened’, <i>hixvir</i> ‘grew pale’ <i>hicliax</i> ‘succeeded’, <i>hidrim</i> ‘went south’ <i>hišmid</i> ‘destroyed’, <i>hilbin</i> ‘whitened’
Middle	<i>niXYaZ</i>	unaccusative unergative	<i>nišbar</i> ‘broke’, <i>ne’elam</i> ‘disappeared’ <i>nixnas</i> ‘entered’, <i>ne’emad</i> ‘stood up’
Middle Intensive	<i>hitXaYYeZ</i>	unaccusative unergative	<i>hitparek</i> ‘fell apart’, <i>hitpocec</i> ‘blew up’ <i>hit’akeš</i> ‘insisted’, <i>hitxabek</i> ‘hugged’

Table 3: Hebrew templates and their possible argument structure alternations.

constructions were identified using the two standard diagnostics in Hebrew, verb-subject inversion (Shlonsky 1987) and the possessive dative (Borer and Grodzinsky 1986).⁴

I set aside ditransitive verbs, which pattern with transitives, and the passive templates *XuYYaZ* and *huXYaZ*, which are fully predictable (Kastner and Zu 2014a,b).

Another way of looking at the data is which mappings are *impossible*, as in Table 4. The system presented here is set up to allow the alternations in Table 3 and disallow the alternations in Table 4.

Template		Unattested alternation
Intensive	<i>CiCeC</i>	unaccusative
Middle	<i>niCCaC</i>	transitive
Middle Intensive	<i>hitCaCeC</i>	transitive

Table 4: Hebrew templates and their impossible argument structure alternations.

3. Deriving the Templates

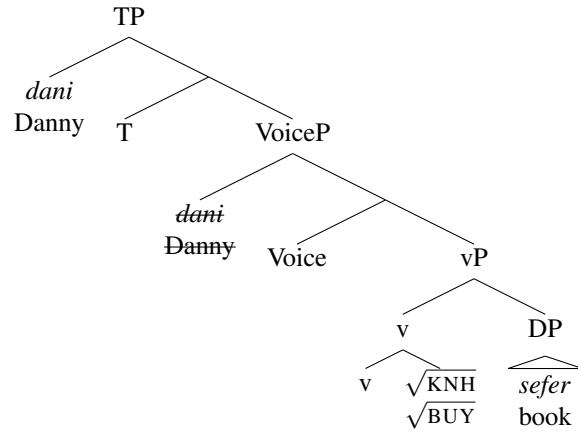
On the account developed here, templates are not morphemes (contra Doron 2003 and Arad 2005). Rather, the particular morphophonology of each template is the result of inserting the vocabulary items CAUS, INTNS and MID, in the manner explained below.

I assume that word formation is syntactic and cyclic (Halle and Marantz 1993, Bobaljik 2000, Embick 2010), with a functional head *v* introducing an event and a functional head Voice introducing an external argument (Kratzer 1996, Marantz 2013b). In this kind of system, the syntax constrains the possible interpretations, leaving the lexical semantics to the root (Schäfer 2008, Myler 2014, Wood to appear b).

⁴Though see Gafter (2014) on the validity of possessive datives as an unaccusativity diagnostic.

A standard, unmarked, active sentence contains by default a silent Voice head and a silent *v* which categorizes a root that is adjoined to it.

- (3) *dani kana sefer*
 Danny bought book
 ‘Danny bought a book’



Nothing about this structure specifies that a verb like *kana* ‘bought.SMPL’ is transitive and a verb like *kafac* ‘jumped.SMPL’ is unergative. The interpretation of the root may be idiosyncratic, in Hebrew as in English; the syntax merely serves to constrain possible interpretations.

I follow Wallace (2013) in adopting a cyclic approach to Semitic morphology in which overt Voice can be spelled out as an affix and overt *v* as an autosegmental affix (gemination/de-spirantization). In what follows we will make use of Voice, *v* and *p* heads.

The different kinds of Voice may only manipulate the syntax, that is, whether a specifier may or may not be merged.

- (4) a. **Voice**. The standard Voice head places no restrictions and is silent.
- b. **Voice_{D}**. This head requires that a DP be merged in its specifier, in effect introducing an external argument. Schäfer (2008, 174) suggests such a Voice head for subjects and expletives in German; Wood (to appear b) adopts the suggestion for subjects and the expletive *-st* in Icelandic. While in German and Icelandic this head is silent, in Hebrew it is spelled out as the VI CAUS: Voice_{D} ↔ CAUS.
- c. **Voice_∅**. This head prevents a DP from being merged in its specifier. Schäfer (2008) uses this head for German and Greek nonactive constructions; Spathas et al. (to appear) call it Middle Voice in Greek; and Wood (to appear a) notates it Voice_{} for Icelandic. A silent head in German and Icelandic, in Greek it is spelled out as a nonactive suffix and in Hebrew it is similarly spelled out as the VI MID: Voice_∅ ↔ MID.

The *v* head introduces an event and categorizes the root.

- (5) a. **v**. The standard *v* head places no restrictions and is silent.
- b. **v_{ACT}**. This “flavor” of *v* is similar to default *v*, except that at interpretation it imposes a semantic requirement that the event be an Action, i.e. volitional (Doron 2003). It is spelled out by the VI INTNS: v_{ACT} ↔ INTNS.

Some existing work in DM has suggested that there exist “flavors” of *v* such as v_{CAUS}, v_{BECOME}, v_{DO} and v_{BE} (Harley 2009). These heads do not form part of the system presented

here; in our system the different features on *v* have no effect in the syntax. Since *v* introduces an event, a “flavor” of *v* can only specify what kind of event this is. For Hebrew, it seems that only overt v_{ACT} is required alongside the default *v*.⁵

In addition to Voice and *v*, I adopt the proposal in Svenonius (2003, 2007) that a prepositional phrase is made up of a functional projection *pP* (akin to VoiceP) which introduces the “external argument” of the preposition. The Figure is introduced in the specifier of *pP* and the Ground in the complement of *P*.

- (6) a. **p**. The standard *p* head places no restrictions and is silent.
 b. p_{\emptyset} . This head prevents a DP from being merged in its specifier. Wood (to appear a) uses the notation $p_{\{\}}$ for a similar head in Icelandic.
 It is spelled out by the VI MID: $p_{\emptyset} \leftrightarrow \text{MID}$.

These functional heads can derive all templates but the passive ones. I take the passive templates to be derived from their active counterparts via a functional head *Pass* (Doron 2003, Alexiadou and Doron 2012). There are a number of reasons to treat the passive templates differently (Kastner and Zu 2014a,b): the meaning of the passive verb is compositional and transparent in that verbs in “passive intensive” *XuYYaZ* are the passivized version of an active verb in “intensive” *XiYYeZ*, and verbs in “passive causative” *huXYaZ* are the passivized version of an active verb in “causative” *hiXYiZ*. The two passive templates are also special since the external argument in a passive clause must be agentive and cannot be a cause. This is not the case for verbs in the “middle” template *niXYaZ*, for example, which can receive an inchoative reading. For these reasons, I will set the passive templates aside and proceed to derive the other five templates.

Table 5 summarizes the analysis. Note that non-default *v* (v_{ACT}) corresponds to a semantic restriction and gemination, whereas non-default Voice and *p* ($\text{Voice}_{\{D\}}$, Voice_{\emptyset} , p_{\emptyset}) correspond to a syntactic restriction and prefixation.

Heads		Syntax	Semantics	Phonology	
Voice	<i>v</i>	(underspecified)	(underspecified)	SMPL	<i>XaYaZ</i>
Voice	v_{ACT}	(underspecified)	Action	INTNS	<i>XiYYeZ</i>
Voice _{D}	<i>v</i>	External argument	(underspecified)	CAUS	<i>hi-XYiZ</i>
Voice _∅	<i>v</i>	No external argument	(underspecified)	MID	<i>ni-XYaZ</i>
Voice _∅	v_{ACT}	No external argument	Action	MID INTNS	<i>hit-XaYYeZ</i>
Voice	<i>v</i> p_{\emptyset}	External argument = Figure	(underspecified)	MID	<i>ni-XYaZ</i>

Table 5: The requirements of functional heads in the Hebrew verb.

On the phonological side, this approach follows much fruitful work on the morphophonology of some Central and East Semitic languages which takes templates to be manipulations of a metrical structure (McCarthy 1981, McCarthy and Prince 1990, Tucker 2010, Wallace 2013). This manipulation introduces supersegmental features and vowel alternations, and

⁵The notion of agentivity may well be encoded in the grammar of Hebrew: the external argument of “intensive” and passive verbs must be agentive, as well as the external argument of certain adjectival passives (Doron 2013a).

has been implemented as well-formedness constraints (Tucker 2010, Wallace 2013) and realization rules for specific vowels (Faust 2012). For present purposes, I will assume that some kind of readjustment rule handles the vocalic manipulation; since the manipulation of foot structure is predictable for each template, I set it aside.

3.1 XaYaZ — “Simple” (e.g. *pakad* ‘counted’, *halax* ‘walked’)

The “simple” template is the result of default *v* and Voice merging in the structure, as in (3) above. Since neither *v* nor Voice constrain the structure, the verb might be unaccusative, unergative or transitive, as noted in Table 3. A default vowel *-a-* is inserted.

3.2 XiYYeZ — “Intensive” (e.g. *piked* ‘commanded’, *kipek* ‘jumped around’)

The “intensive” template is the output of v_{ACT} and default Voice. v_{ACT} types the event as an Action, meaning that the event must be volitional. Unergative and transitive verbs are thus both possible. Unaccusative “intensive” verbs are ruled out since the derivation crashes at LF.⁶ At PF, the VI INTNS takes the form of gemination of the medial root consonant alongside readjustment rules that insert the right vowels. See Wallace (2013) for a more thorough implementation in other Semitic languages.

One possible counterexample is the case of “verbs of emission” such as *tifef* ‘dripped. INTNS’, *cilcel* ‘rang. INTNS’ and *hidhed* ‘echoed. INTNS’. It is unclear whether these should be categorized as unaccusative or unergative in Hebrew; see Siloni (2002) and Gafter (2014) for some discussion. At least some of these verbs are ambiguous between transitive and inchoative meanings, implying that an inchoative reading may be coerced from an otherwise transitive structure.

3.3 hiXYiZ — “Causative” (e.g. *hifkid* ‘deposited’, *hidrim* ‘went southward’)

The “causative” template is the outcome of merging default *v* and Voice_{D}. Voice_{D} requires that an external argument be merged, resulting in unergative and transitive verbs. CAUS is pronounced as the prefix *hi-* and the relevant vocalic readjustment rules.

Even though unaccusative CAUS verbs should be disallowed, there does exist a small class of such verbs, many of which are ambiguous with a true causative. Their existence requires an explanation.

- (7) a. *hilbin*
 ‘whitened’ (became white / made white)
- b. *he’edim*
 ‘reddened’ (became red / made red)
- c. *hixlik*
 ‘slipped’ / ‘smoothed’ (made smooth)

⁶Or perhaps v_{ACT} raises and adjoins to Voice.

(8) a. *hixvir*
 ‘grew pale’ (*‘made someone pale’)
 b. *hišmin*
 ‘became fat’ (*‘made someone fat’)

(9) a. $\text{Voice}_\emptyset \leftrightarrow \text{CAUS} / __ \{\sqrt{\text{LVN}}, \sqrt{\text{XVR}}, \dots\}$
 b. $\text{Voice}_\emptyset \leftrightarrow \text{MID}$

(10) a. *hilbin* ~ **nilban*
 b. *he'edim* ~ **ni'dam*

c. *hixlik* ~ **nixlax*
 d. *hišmin* ~ **nišman*

The “middle” template is the output of default *v* combining with Voice_\emptyset , the Voice head which prevents a phrase from merging in its specifier. MID is pronounced as the prefix *ni-* and the relevant vocalic readjustment rules. Presumably this structure should disallow both unergative and transitive verbs, leaving only unaccusative verbs possible. Yet unergative verbs are possible as well: they turn out to be constrained in a systematic way.

(11) a. *nixnas le-*
‘entered into’
b. *ne’emad al*
‘stood on’
c. *nidxaf derex / le-*
‘pushed himself through/into’
d. *ne’exaz be-*
‘held on to’

(12) a. *nilxam be-*
‘fought with’
b. *niršam le-*
‘registered for’

⁷It is tempting to say that these verbs are deadjectival or denominal, but then the question arises of who to “extract” the root from the existing adjective or noun.

- (13) a. ??*nixnesu* *ha-xayalim* *la-basis*
 entered.MID.3PL the-soldiers to.the-base
 (int. ‘The soldiers entered the base’)
- b. ??*nilxemu* *ha-xayalim* *ba-oyev*
 fought.MID.3PL the-soldiers in.the-enemy
 (int. ‘The soldiers fought the enemy’)
- (14) ?? *nixnesu* / *nilxemu* *l-i* *ha-xayalim*
 entered.MID.3PL fought.MID.3PL to-me the-soldiers
 (int. ‘My soldiers entered/fought’)

I claim that in these cases an external argument is indeed merged and that the structure is unergative. What does exist in the structure is an obligatory pP complement to the verb (Svenonius 2007). The Figure (specifier) of this pP is null and is interpreted as coreferential with the specifier of VoiceP.⁸

- (15) *yossi* *nidxaf* *derex*
 Yossi pushed.MID through
 ha-kahal
 the-crowd
 ‘Yossi pushed his way through
 the crowd’, ‘Yossi pushed himself
 through the crowd’
-

Wood (to appear b, 18–20) provides a similar account of “figure reflexives” in Icelandic. In figure reflexives, an agentive external argument is the object of a preposition (“Figure”) with respect to a spatial location (“Ground”). In Icelandic the expletive *-st* creates certain anticausatives when merged in Spec, VoiceP (Wood 2012). This expletive can also be merged in the specifier of p, in which case there is no new Figure introduced and the Figure is interpreted as coreferential with the external argument. A similar logic applies for Hebrew: Voice_Ø and p_Ø are both spelled out as MID, and both serve to block the introduction of a specifier their respective maximal projections. What Icelandic does with an expletive, Hebrew does with the functional head itself.

As shown in (12), even verbs in which the external argument is not interpreted as undergoing a change of location in relation to the Ground take pP as their complement. This seems to be the case in Icelandic as well (Wood to appear a, §4.2.4).

To sum up, the “middle” template can be brought about either by merger of Voice_Ø, in which case the structure is unaccusative, or by merger of a pP headed by p_Ø, in which case the structure must contain an indirect object.

⁸ p_Ø will then need to be spelled out in the same cycle as v and Voice.

3.5 hitXaYYeZ — “Middle Intensive” (e.g. *hitpaked* ‘allied himself’, *hitparek* ‘fell apart’)

Verbs in the MID INTNS template are the result of both v_{ACT} and $Voice_{\emptyset}$ being merged in the structure. Phonologically, INTNS conditions de-spirantization and the vowel pattern. MID is then pronounced as the prefix *hit-* rather than *ni-* in the context of v_{ACT} /INTNS.

Verbs in these classes can be divided roughly in two. Derived anticausatives (16) are derived transparently as anticausatives of their “intensive” counterparts. An existing transitive verb with v_{ACT} is detransitivized by $Voice_{\emptyset}$:

- (16) a. *pirek* ‘dismantled.INTNS’ ~ *hitparek* ‘fell.apart.MID.INTNS’
 b. *pocec* ‘exploded.INTNS’ ~ *hitpocec* ‘exploded.MID.INTNS’
 c. *bišel* ‘cooked.INTNS’ ~ *hitbašel* ‘got cooked.MID.INTNS’
 d. *qibel* ‘received.INTNS’ ~ *hitqabel* ‘was received.MID.INTNS’

The other kinds of verbs in this template is are reflexives (17) and reciprocals (18):

- (17) a. *nigev* ‘wiped.INTNS’ ~ *hitnagev* ‘toweled.down.MID.INTNS’
 b. *’iper* ‘applied.makeup.INTNS’ ~ *hit’aper* ‘put.on.makeup.MID.INTNS’
 c. *siken* ‘dangered.INTNS’ ~ *histaken* ‘dangered.himself.MID.INTNS’
 (18) a. *nišek* ‘kissed.INTNS’ ~ *hitnašek* ‘kissed.with.MID.INTNS’
 b. *xibek* ‘hugged.INTNS’ ~ *hitxabek* ‘hugged.with.MID.INTNS’

These verbs pose a problem: they fail the unaccusativity diagnostics and hence have been argued to be unergative (Siloni 2012, 314). In fact, the unique character of these verbs is such that they are volitional (v_{ACT}) without a separate external argument ($Voice_{\emptyset}$). Intuitively they are “unergative” since they are volitional, but syntactically they lack a separate argument. Recently, Alexiadou and Schäfer (2013), Alexiadou (to appear) and Spathas et al. (to appear) have suggested that reflexives in Greek should be analyzed along similar lines, through merger of nonactive Middle Voice and a bound anti-assistive intensifier *afto-*. See the works cited for additional discussion of whether these reflexives are unaccusative or unergative.

It is also worth noting that some MID INTNS verbs are not derived from any existing “intensive” verb.

- (19) a. **ihev* ~ *hit’ahav* ‘fell in love’
 b. **ilef* ~ *hit’alef* ‘fainted’
 c. **libet* ~ *hitlabet* ‘had doubts’

Phonologically we see the effects of v_{ACT} in gemination and vowel patterns, but there is no standalone verb with this head. To account for this, I suggest that we turn to recent work by Anagnostopoulou and Samioti (2012, 2013) and Marantz (2013a) on contentless categorizers. In these works, the authors survey a number of environments in Greek, Japanese and English in which an overt verbalizing suffix appears in a noun or adjective but does not contribute any eventive semantics. For example, the Greek adjectives in (20) are stative, not eventive (Anagnostopoulou and Samioti 2013, 230):

- (20) a. *if-an-tos* weave-VBLZ-ADJ ‘woven’
 b. *fit-ef-tos* plant-VBLZ-ADJ ‘planted’

Marantz (2013a) argues that similarly, in English, an *atomized individual* need not have undergone an atomizing operation.

Strikingly, in Greek the verbalized construction might not even result in an acceptable verb. Anagnostopoulou and Samioti (2013, 231) give the following example:

- (21) *kamban-a* ‘bell’ ~ ??*kamban-iz-o* ‘bell (v)’ ~ *kamban-is-tos* ‘sounding like a bell’

The Greek pattern is similar to Hebrew root-derived “middle intensive” verbs: a verbalizer exists in the structure but it contributes no semantics. How and why this happens is a topic of current work in a number of languages, Hebrew included. For Greek, Anagnostopoulou and Samioti (2012, 2013) argue that only events can combine with *-tos*, hence the need for a semantically vacuous verbalizer.

4. Alternative Proposals

A traditional view might contend that each template is a morpheme and that these morphemes are then interpreted. However, the data presented here show that this cannot be the case: a single phonological form, e.g. hiXYiZ, may be causative or inchoative, so the semantics is not derived from the morphophonology (the template).

The seminal analysis in Doron (2003) and its successors in Alexiadou and Doron (2012) and Doron (2013b) provide a more insightful morphosemantics of the Hebrew verb. Nevertheless, the mapping from semantics to templates in these works is not transparent. In Doron’s hybrid syntax/semantics, functional heads are arranged hierarchically to derive each template. For example, the structure for a “causative” verb like *hifgiš* ‘caused to meet’ is assumed to contain a MIDDLE head μ as well as a CAUSE head γ (Doron 2003, 61):

- (22) [External Argument [CAUSE [Internal Argument [MIDDLE [$\sqrt{\text{PGS}}$]]]]]

However, while the CAUSE head can be argued to reflect a causative morpheme/prefix, the existence of a MIDDLE head shows that additional stipulations are required if the semantics is taken as the starting point; this latter head also appears in the “middle” template, though the semantics and phonology of these templates are different. Furthermore, it is unclear how to derive either the syntax or the phonology from the semantic structure: it is difficult to treat the elements in (22) as morphemes and arrange them in a structure that can be spelled out cyclically; MIDDLE and CAUSE in (22) cannot both be spelled out overtly to derive a single prefix. Instead, I have argued here for a system that interprets the syntax at PF and LF. The system developed here attempts to make use of heads that have been argued for elsewhere or that have phonological justification. Once the correct functional heads are identified, a constrained typology of verb forms emerges.

Elsewhere in recent work, Arad (2005) has invoked conjugation classes in order to account for alternations between templates, whereas for us argument structure alternations arise naturally as a result of the constraints imposed by different functional heads. See Arad (2005) also for a critique of the lexicalist account in Aronoff (1994), which is shown to undergenerate. A more recent lexicalist account suffers from the conceptual drawback that all verbs are claimed to arise through anticausativization (Laks 2013, 2014); inchoative

verbs that do not have a causative alternation are stipulated to have a “frozen” null causative verb in the lexicon, rendering the anticausativization hypothesis unfalsifiable.

5. Conclusion

The account presented in this paper brings Semitic verbal morphology in line with contemporary work on argument structure. Empirically, this account explains the existing patterns while avoiding the weaknesses of other analyses via syntactic structure building, followed by a direct mapping to the morphophonology. Theoretically, we ground the mapping from phonology to semantics in the syntax.

Technically speaking, we see that argument structure must be built from both *v* and Voice constraining the lexical semantics of the root (Pylkkänen 2008, Harley 2013, Marantz 2013b, Legate 2014), and we further our understanding of how the three combine at LF and PF. Functional heads in the verbal structure have been claimed to have different features or flavors, and Semitic languages provide an excellent testing ground for constraining their combinatorics. Here I have argued for the role of Voice and *v*, building on the insights of Doron (2003). For Arabic and Akkadian, other work has investigated how Applicative heads might similarly fit into the structure (Al-Kaabi 2012, Wallace 2013).

The building blocks used here are, for the most part, those that have been proposed elsewhere. But here they are argued to have overt pronunciations, including specific types of Voice. The one new functional element introduced is an agentive “flavor” of *v*. This is in line with a system in which Voice manipulates syntactic objects (such as specifiers) and *v* introduces an event, categorizing the root as a verb. I have argued here that the resulting system is able to capture the facts in a way that a phonology-based, semantics-based or lexicon-based system cannot.

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