QoTeT verbs in Modern Hebrew and the Pro-Root vs. No-root debate

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Abstract: The QoTeT verbs of Modern Hebrew (e.g. *χolel* 'bring about'), defined by the first vowel /o/, are a relatively minor pattern. Two aspects of these verbs are examined in this paper. First, their distribution in the different verbal classes, and second, the variation some of them exhibit in the PST stem. Two approaches to Semitic non-concatenative morphology, dubbed *Pro-root* and *No-root*, are compared with respect to their ability to cover the facts, with the goal of understanding the basic tools necessary in each approach. The *Pro-root* view is argued to offer a slightly better fit for the data.

Keywords: Allomorphy, Hebrew, Paradigm, Root, Semitic.

1. Introduction

Verbs in Modern Hebrew (MH) belong to one of five verbal classes. These classes are defined by their distinct syllabic structures, the vocalizations of their stems, and the affixes they carry (if any). As shown in (1), the same set of consonants very often appears in more than one verbal type, often (but not always) yielding verbs with related meaning (the set in 1 is exceptional in that it appears in *all* verbal types).

(1) Verbal classes of Modern Hebrew

		3MSG.PST	MSG.PRS	3MSG.FUT	
B1	QaTaL	dagam	dogem	ji-dgom	'survey (=find examples)'
B2	niQTal	ni-dgam	ni-dgam	ji-dagem	'be surveyed'
B3	hiQTiL	h-idgim	m-adgim	j-adgim	'illustrate (tr.)'
B4	QiTeL	digem[1]	me-dagem	je-dagem	'make exemplary (tr.)'
B5	hitQaTeL	h-it-dagem	m-it-dagem	j-it-dagem	'make exemplary (refl.)'

Verbal types are traditionally referred to by the form of the 3MSG.PST with a set of variable consonants, here <Q,T,L>. Thus, types B4 and B5, for instance, are QiTeL and hitQaTeL.

As shown in (2), all verbal types can host verbs with identical 2nd and 3rd consonants. In types B4 and B5 there are *two* such configurations: (i) QiTeT/hitQaTeT, with the same vocalizations as regular verbs; and (ii) QoTeT/hitQoTeT, with a vowel *o* appearing after the first consonant throughout the paradigm. Verbs of the type (hit)QoTeT are the topic of this paper.

(2) Verbs with identical 2nd and 3rd consonants in Modern Hebrew

		3MSG.PST	MSG.PRS	3MSG.FUT	
B1	QaTaL	tasas	toses	ji-tsos	'ferment (intr.)'
B2	niQTal	ne-χkak	ne-χkak	je-χakek	'be engraved'
B3	hiQTiL	h-itsis	m-atsis	j-atsis	'ferment (tr.)'
B4	QiTeL	χifef	me-χafef	je-χafef	'act sloppily'
		ʁoʃeʃ	me-ʁoʃeʃ	je-ʁoʃeʃ	'impoverish (tr.)'
B5	hitQaTeL	h-it-χafef	m-it-χafef	j-it-χafef	'bail out'
		h-it-ʁoʃeʃ	m-it-ʁoʃeʃ	j-it-ʁoʃeʃ	'become impoverished'

Three aspects of the data are central to this paper:

[1] The QiTeL and hitQaTeL verbs in this table are originally an innovation of soldiers in the Israeli Defense Forces, they might not be familiar to all speakers of Modern Hebrew.

(3) Important facts about QoTeT verbs

i. Verbs with an exceptional /o/ as the first stem vowel occur only as sub-classes of B4 and B5. There are no /QoTaL/ or /hoQTiL/ verbs.
ii. Verbs with /o/ as the first stem vowel occur only with identical 2nd and 3rd consonants. With one exception, there are no (hit)QoTeL verbs (where T,L are distinct).
iii. The paradigm of such QoTeT verbs is somewhat unstable. It seems to be undergoing a merger with the more general QiTeL/QiTeT verbs, in that 3MSG *Roʃeʃ* can also be realized *ʁiʃeʃ* (a fact first reported by Bat-El 2003).

There are two major approaches to the storage of verbs in Modern Hebrew. The more traditional approach assumes that verbal forms are decomposed into two morphological units: a root and a template. For instance, a verb like *digem* 'make exemplary' in (1) involves the root <d,g,m> and the template <QiTeL>. This approach is upheld by many contemporary researchers (see for instance Faust & Hever 2010 and references therein); a refined version is championed by Hagit Borer in her various analyses of Modern Hebrew morphology (e.g. Borer 2013). For these researchers, both the root and the template are stored lexical items (*grosso modo*).

A competing approach, whose most explicit representation to date is found in Outi Bat-El's work (Bat-El 1994, 2002, 2003), claims that only templates are real morphemes. A verb like *digem* is stored in the knowledge of speakers only as a full stem /digem/. A redundancy rule identifies it as belonging to the QiTeL type through its vocalization. But <d,g,m> is not a morpheme in that it is not a lexical unit, only the residue of the entry /digem/ without its vocalization.

I dub these approaches *pro-root* and *no-root.* As I will show in this paper, the two approaches are not equally explanatory with respect to the three facts in (3). The next section provides more facts on (hit)QoTeT verbs and on the two approaches to the non-concatenative morphology of Modern Hebrew. Section 3 then discusses (3i,ii). It is shown that both facts follow from the traditional *pro-root* analysis, but do *not* follow from the *no-root* approach. Section 4 turns to the variation reported in (3iii). First, experimental evidence is shown to confirm the intuition that only the PST form of QoTeT verbs exhibits this variation, and so it is imprecise to state that this minor pattern is merging with the major pattern. A phonological rationale is provided for this limitation on variation. It is then argued that while this variation is equally expressible in both approaches, it sheds light on an inelegant aspect of the *no-root* approach. Section 5 concludes.

2. More on QiTeL, hitQaTeL and (hit)QoTeT

As explained above, (hit)QoTeT verbs are a subtype of QiTeL and hitQaTeL verbs. These two verbal classes are the most productive ones in MH for transitive and intransitive verbs respectively. They hosts most denominal verbs (*néged* 'against' > *niged* 'to contrast', *hitnaged* 'to oppose'), and most verbs based on loans (*gigel* 'to google', *hitgagel* 'be googled or googleable').

As already foreshadowed above, it is not the case that all verbs in QiTeL and hitQaTeL with identical 2nd and 3rd consonants are (hit)QoTeT verbs. There are about 45 QiTeT verbs,

and a similar number of QoTeT verbs. Note, again, that the stems of QiTeT and QiTeL verbs are different in PST and PRES/FUT, while QoTeT verbs display a single stem.[2]

(4) QiTeL, QiTeT, QoTeT – stems and numbers

	#	PST	PRES	FUT	
a. QiTeL	∞	kibel	-kabel		'receive'
b. QiTeT	45	ʁises	-ʁases		'spray'
		ʦsitet	-ʦsatet		'cite'
c. QoTeT	47	(-)ʁoʃeʃ			'impoverish (tr.)'
		(-)ʦsotet			'eavesdrop'

The situation for hitQoTeT is similar. There are about 33 hitQaTeT verbs and about 57 hitQoTeT ones. Importantly, in the case of hitQaTeL the stem is identical for all three tenses *in the three verb types*.

(5) hitQaTeL, hitQaTeT, hitQoTeT – stems and numbers

	#	PST	PRES	FUT	
a. hitQaTeL	∞	-it-ʁaʃem			'be impressed'
b. hitQaTeT	33	-it-χamem			'warm up'
		-it-bases			'base (a claim) on sthg'
		-it-palel			'pray'
c. hitQoTeT	57	-it-ʁomem			'rise'
		-it-boses			'wallow'
		-it-moded			'confront'

QiTeL and hitQaTeL are the only verbal classes to host verbs with four consonants (with some principled exceptions). Such verbs come in three types. Some verbs involve four different consonants, like *tirgem* 'translate'. Other verbs reach the number of four consonants through reduplication, either full *gimgem* 'stutter' or partial *ʦsiχkek* 'giggle' (these examples are from QiTeL, but there are many examples in hitQaTeL as well).

Importantly, even though the QoTeT verbs are a sub-type of QiTeL and hitQaTeL, there are no quadriconsonantal verbs *of any type* with the vowel /o/. In other words, there are no verbs of the type **torgem*, **gomgem*, or **ʦoχkek*. A single verb without 2nd and 3rd identical consonants and a vocalization *o* features in both QiTeL and hitQaTeL: *ʁoken* 'empty (tr.)', *hitʁoken* 'empty (intr.)'.[3]

To summarize, QoTeT verbs are characterized by having the vowel /o/ where their class dictates another vowel. Thus defined, there are several gaps in the distribution of QoTeT verbs. First, as already mentioned in (3i) above, they appear only in QiTeL and hitQaTeL. Second, they always involve identical 2nd and 3rd consonants. And third, even though they feature in QiTeL and hitQaTeL, which often involve four consonants, there are no

[2] Because QiTeL, hitQaTeL are so productive, it does not make sense to count the number of verbs in these templates. The counts in (4,5) are based on systematic introspection, rather than a dictionary check.

[3] Bat-El (1994, 2003) mentions the denominal *hitbokses* 'box (sport)', which does have identical final stem consonants but is also quadriradical. I also encountered the denominal *hitkonekt* 'connect oneself' in a flier distributed in 2013 in the Hebrew University. Such innovations should be considered jocular. I have found only two occurrences of *hitbokses* on google (very few considering the reported existence of this verb at least since 1994) and no occurrences of *hitkonekt* (besides said flier).

quadriradicals of any type with the vocalization /o/, even if the final and penultimate consonants are identical.

In the next section, we shall see that the traditional, *pro-root* approach insightfully explains away all of these distributional lacunas; but the *no-root* approach cannot explain them.

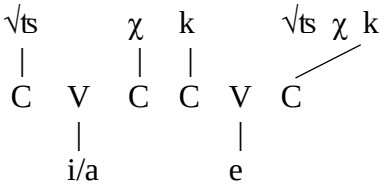
3. The distribution of (hit)QoTeT verbs

3.1 The pro-root approach and QoTeT verbs

Within the *pro-root* approach, verbs generally involve the combination of two lexical entries: a root and a pattern. Thus, a verb like *digem* 'make exemplary' is based on a root <d,g,m>, a pattern QiTeL. Speakers know that this combination corresponds to an entry in their vocabulary.

Specifically important for the present purpose is the analysis of quadriradical stems based on triradical roots, such as *ʦiχkek* 'giggle'. Since McCarthy (1981), such verbs are seen as the result of "template satisfaction", one version of which is presented in (6). It is assumed that the tripartite set <ʦ,χ,k> is associated to a template with 4 positions. Associating the root to the templatic positions from left to right leaves the final C empty. In order to satisfy the template, the root is reduplicated and association then proceeds from right to left (for alignment reasons). There is place for only one consonant, the last one.[4]

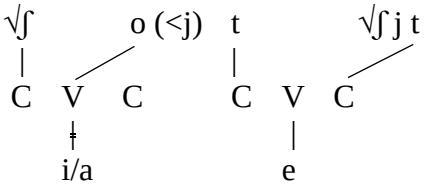
(6) *ʦiχkek* 'giggle' in the pro-root approach



Importantly, for many verbs like the one in (6), there are non-reduplicated equivalents. For instance, for *ʦiχkek* 'giggle' there is *ʦaχak* 'laugh'.

The traditional *pro-root* analysis of QoTeT verbs, mentioned for instance in Izre'el (2006) and Borer (2013), assumes that the they parallel verbs like *ʦiχkek*. Unlike these, they are based on roots with a medial /j/. As argued for extensively in Faust (2015), the radical /j/ is associated to an allomorph /o/ in preconsonantal positions.[5] It can be assumed, then, that this /o/ occupies the first vocalic position of the verbal stem, thus blocking the regular vocalization – as represented in (7).[6]

(7) QoTeT verb *ʃotet* 'wander'



[4] See Faust & Enguehard (2018) for an argument in favor of this analysis, as opposed to a spreading analysis.
[5] Indeed, Izre'el (2006) proposes in passing that the root of such verbs is √QOTT.
[6] That radicals may have allomorphs as well as allophones is a central point in Faust (2016).

Indeed, like other verbs in this reduplicated pattern, several QoTeT verbs are related to non-reduplicated items; in these, a medial /j/ does surface. For instance, *ʃotet* 'wander' is related to *ʃijet* 'navigate'.

This analysis immediately derives all of the distributional statements summarized at the end of the previous section. First, it trivially captures the generalization that these verbs always involve identical 2nd and 3rd consonants. Moreover, if QoTeT verbs are (reduplicated) quadriradicals, then their exclusive appearance in QiTeL and hitQaTeL follows, as these are the only verbal types which host quadriradicals. No verbs with /o/ are therefore expected in other types, such as *QoTaL, *hoQTiL. In addition, there are no quadriradical verbs with /o/ *within* QiTeL and hitQaTeL such as (hit)QoTLeL and (hit)QoTQeT because these would require five-consonant templates CVCCCVC, an otherwise unattested scenario.[7]

The success of the pro-root approach in deriving these distributional lacunas is not shared by the no-root approach, as the next subsection shows.

3.2 The no-root approach and QoTeT verbs

Bat-El (2003) describes the minor pattern QoTeT from a word-based, *no-root* perspective, as part of a larger presentation of this approach. In her analysis, she makes two assumptions. First, like <i,e>, <o,e> is a legitimate pattern in Modern Hebrew. Thus, an entry like /ʁoʃeʃ/ 'impoverish' is a legitimate verbal entry. Distinguishing between legitimate and illegitimate entries is important, because /gugel/ 'google', for instance, cannot serve as a verbal stem; it must be changed to a legitimate stem, as in the real example cited above *gigel* 'to google'. Second, Bat-El assumes that QoTeT is not a pattern in its own right, but a sub-pattern of QiTeL. Yet in her analysis, this remains an assertion; below, I attempt to make it follow from the general principles of the *no-root* approach.

From what has already been described, it emerges that this approach has two types of stem-verification mechanisms. First, there is a filter on what is a possible verbal stem. Then, there are redundancy rules that recognize the verbal class in the input. Thus, the input /digem/ 'make exemplary' is first judged as a legitimate verbal entry, and then recognized by the redundancy rule as belonging to QiTeL because of its vocalization (I will return to this double-check in section 4.3). Now consider an input like /ʁoʃeʃ/ 'impoverish'. Since QoTeT is a sub-class, we may suppose there is no redundancy rule that recognizes <o,e> as a type. Rather, when the stem is examined, it is found to resemble QiTeL verbs by its second vowel /e/. This is a "good enough" sign of its belonging to the pattern <i,e>.

Now, how may the distributional lacunas of QoTeT verbs be explained? If /o/ is a legitimate base vowel in the first vocalic position *within* QiTeL and hitQaTeL, why is it not one within other verbal types? Why do we not find *QoTaT and *hoQTiT verbs, based on /QoTaT/, /hoQTiT/, which are subsequently found to be "good enough" by having the correct second vowel? Of course, one can rule out /QoTaT/, /hoQTiT/ arbitrarily from the list of possible verbal entries, before the redundancy rules are even appealed to. Yet this only means that the approach cannot explain the impossibility of such items; it must *assume* them.

Similarly, and even more worryingly, if /o/ is a legitimate base vowel in the first vocalic position *within* QiTeL and hitQaTeL, why are there no QoTQeT and QoTLeL verbs (the latter even fulfilling the requirement of the identity of the two final Cs)? If <o,e> is a legitimate vocalization for a verbal entry, which can be found to be "good enough" by the redundancy rules; why is it not possible in verbs with four consonants? It seems that such unattested verbs are predicted by the *no-root* approach, which does not accept the "abstract" view of stems like /ʁoʃeʃ/ being quadriradical.

[7] There are no underived verbs with five radicals. Denominal verbs might reach five radicals, e.g. *kimpres* 'compress'.

Alongside its wrong prediction for possible QoTeT verbs, the *no-root* approach also cannot capture the attested limitation to reduplicated items. If <o,e> is a legitimate pattern, which can be related to QiTeL through the general redundancy rules, why can't a verb QoTeL emerge? Again, with one exception, such verbs are not attested.

Of course, distributional lacunas do not always need to be motivated synchronically. It can be the case that the specific scenario leading to the missing verbs has not yet come about. indeed, the exception I keep mentioning might argue that it *is* possible. However that exception can be accounted for, there is reason to think that the ungrammaticality of QoTLeL, QoTeL etc. *is* part of the synchronic knowledge of speaker.

Bat-El notes that among QoTeT verbs one finds many items for which there is a related monosyllabic noun of the form CoC (8a). For Bat-El, this correlation follows from a principle that requires the preservation of as many features as possible of the base in the denominal entry. However, this makes a wrong prediction (as Bat-El herself admits): triradical bases with the vowel /o/ should also be matched with the pattern <o,e>, counter factually as shown in (8b,c). The example in (8c) is especially telling, because the attested verbs does involve identical final and penultimate consonants; and yet, the /o/ of the base is not preserved. The data therefore show that Modern Hebrew speakers *actively* avoid the /o/ vocalization in verbs with any form other than QoTeT.

(8) Possible and impossible denominal verbs in QoTeT

	NOUN		DENOMINAL VERB	
a.	χok	'law'	χokek	'legislate'
	χoʁ	'hole'	χoʁeʁ	'riddle with holes'
	kod	'code'	koded	'code'
b.	koχav	'star'	kiχev, *koχev	'star (e.g. in film)'
	model	'model'	midel, *model	'model'
	kompʁes	'compress'	kimpʁes, *kompʁes	'compress'
c.	toχn-it	'plan'	tiχnen, *toχnen	'make plans'

To summarize, with its surface-oriented view, the *no-root* approach does not – and arguably cannot – analyze QoTeT verbs as quadriradical resulting from reduplicated triradicals. Yet that analysis correctly predicts several aspects of the distribution of such verbs.

The last refuge for the *no-root* approach, already mentioned above, is to claim that speakers simply *know* all of the distributional generalizations, and therefore they obey them. For instance, speakers do not innovate forms like (8b) because they *know* that verbs with /o/ must be of the form QoTeT. While I cannot argue against such a claim here, it leaves these aspects of the data unexplained. It seems to me, therefore, that the *pro-root* approach is a better fit for the data than the *no-root* approach.

The next section examines another aspect of (hit)QoTeT verbs: variation.

4 Paradigm migration in QoTeT verbs

Bat-El (2003) was, to the best of my knowledge, the first to report on an instability in the QoTeT paradigm. She notes that QoTeT verbs are "marginal". For some of these verbs, she adds, there is "free variation" between the minor QoTeT and the major QiTeT patterns. Two additional aspects of Bat-El's description are relevant here. First, according to Bat-El, only

denominal QoTeT verbs exhibit variation. Second, which verbs exhibit variation is lexically-determined (the relevant constraints are unranked only for these verbs).[8]

Since the scope of her paper is much larger, Bat-El does not explore the details of free variation in QoTeT verbs. This lack of detail can be misleading as to the facts of the variation. First and foremost, variation is not limited to denominal verbs (indeed, even Bat-El mentions basic entries like *poʁeʦ~piʁeʦ* 'explode (tr.)'). Moreover, according to my own intuition, the variation is limited in several respects. First, it does not occur for hitQoTeT verbs: *hitʁomem* 'rise' does not alternate with **hitʁamem*. Indeed, none of the hitQoTeT verbs I found are acceptable with the major hitQaTeT pattern. Second, QoTeT verbs exhibit variation only in their PST stem; the PRS/FUT stem does not come to resemble the more general QaTeT/QaTeL stem. To illustrate with the examples from the introduction, the PST *ʁoʃeʃ* 'impoverish' exhibits variation with *ʁiʃeʃ* (cf. *ʁises* 'sprsy'), but the PRS/FUT *me/je-ʁoʃeʃ* does not display a variant **me/je-ʁaʃeʃ* (cf. *me/je-ʁases)*.

These aspects of my intuition are summarized in the two tables below (for glosses, see 4,5). As can be seen, the innovation is limited to the PST stem of QoTeT.

(9) Innovation in (hit)QoTeT

	Standard		
	PST	PRES	FUT
a. QiTeL	kibel	-kabel	
QiTeT	ʁises	-ʁases	
QoTeT	(-)ʁoʃeʃ		
b. hitQaTeL	-itʁaʃem		
hitQaTeT	-itχamem		
hitQoTeT	-itʁomem		

⇉

Innovative		
PST	PRES	FUT
kibel	-kabel	
ʁises	-ʁases	
ʁiʃeʃ	ʁoʃeʃ	
-itʁaʃem		
-itχamem		
-itʁomem		

In addition, I also do not accept any variation for QoTeT verbs with a missing initial radical, i.e. for me, *oʁeʁ* 'raise' cannot be pronounced **iʁeʁ*.

In order to see whether my intuitions are shared by other speakers, I conducted an online experiment.

4.1 Experimental confirmation

The experiment concerned only verbs of the QiTeL class.[9] That is, hitQoTeT verbs were not examined. Within the QiTeL class, three verb types with identical 2nd and 3rd consonants were examined:

(10) QiTeL verb types examined

(i) QoTeT – verbs whose standard form involves [o] in all stems.
(ii) oTeT – verbs whose standard form involves [o] in all stems and whose initial C is absent.
(iii) QiTeT – verbs whose standard form involves [i] in PST and [a] PRS/FUT.

There were five verbs of each type. To the extent that this is verifiable, the selected verbs were basic entries, not denominal ones. For each of these verbs, four sentences with both PST and FUT forms were presented, one in each of the following patterns:

[8] These aspects are not presented explicitly, but rather follow from the analysis.
[9] The programming of the experiment's website was achieved with the help of Sarra El-Ayari. The experimental design was thought out with the help of Michael Becker.

(11) Patterns examined

Standard major pattern:	PST – QiTeT; FUT – QaTeT
Standard minor pattern:	PST – QoTeT; FUT – QoTeT
PST innovative pattern:	PST – QiTeT; FUT – QoTeT
FUT innovative pattern:	PST – QoTeT; FUT – QaTeT

For instance, the verb *kofef* 'bend', standardly of the minor pattern, appeared in four sentences:

(12) Illustrative four sentences

a. hu	kofef oto etmol ve-hu gam	je-kofef oto maχar.	Standard minor pattern
b.	kifef	je-kafef	Standard major pattern
c.	kifef	je-kofef	PST innovative pattern
d.	kofef	je-kafef	FUT innovative pattern

'he bent it yesterday and he also will bend it tomorrow'

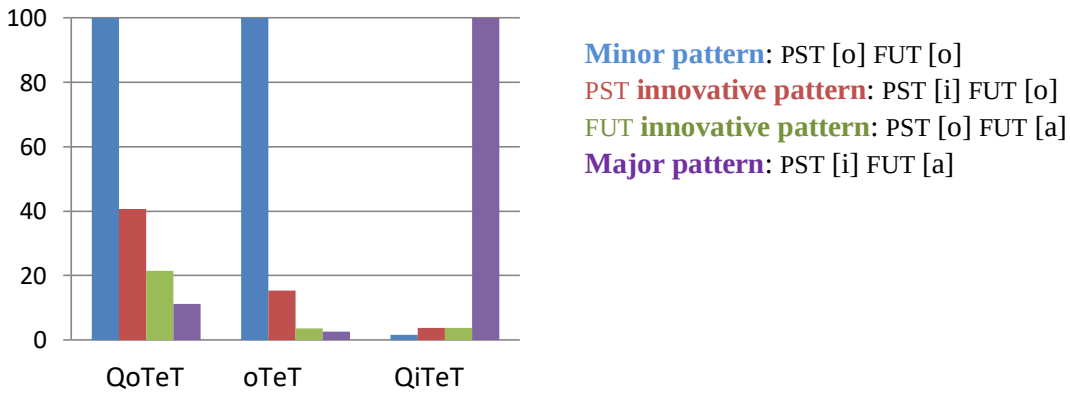
All in all, there were 60 sentences (15 verbs, 4 patterns for each verb). The sentences were all presented in random order, and only in audio form. In all of the sentences, the PST form preceded the FUT form. 33 participants completed the experiment.

If my intuitions are correct, then for a verb like *kofef* 'bend', standardly a minor pattern verb, (12a) should be the most acceptable. The PST innovative pattern (12c) should come next in terms of acceptability, with some people accepting the vowel *i* of the major pattern in the PST form, but not the vowel *a* of the major pattern in the FUT. The FUT innovative and the major pattern should be unacceptable for this verb.

The two other verb types, QiTeT and oTeT, should be acceptable only in the standard form. For standard QiTeT, there is no claim that it ever displays variation with QoTeT; and as for oTeT, recall that according to my intuition, verbs without an initial surface consonant do not exhibit variation.

The results, presented in (13), by and large confirmed my intuitions. All verbs were accepted by all participants in their standard patterns, but QoTeT verbs were also accepted in the PST innovative pattern in 40% of the cases. While the FUT innovative pattern was also accepted by some (21%), the difference between the two innovative patterns is very significant. QiTeT verbs were almost exclusively accepted in their standard pattern, as were oTeT verbs (though, like QoTeT ones, with a slight effect of the PST innovative pattern).

(13) Experimental Results



All QoTeT verbs exhibited the tendency to "migrate" to the major pattern in the PST base only, which I have called the PST innovative pattern. This finding contradicts Bat-El's assertion that whether a verb migrates or not is lexically-determined (unless it is lexically determined for all five verbs checked).

Let me summarize. The presence of the minor QoTeT in the lexicon is equivalent to that of the parallel QiTeT type, but QoTeT verbs exhibit instability: their PST stem is also acceptable with the major vocalization QiTeT. The instability is restricted in its distribution: it does not extend to the PRS/FUT base, does not apply to vowel-initial stems, and does not apply to hitQoTeT verbs at all (the latter claim is only based on my intuition). This limited migration is repeated in (14) below.

(14) Innovation in (hit)QoTeT (repeated from 9)

	Standard			⇉	*Innovative*		
	PST	PRES	FUT		PST	PRES	FUT
a. QiTeL	kibel	-kabel			kibel	-kabel	
QiTeT	ʁises	-ʁases			ʁises	-ʁases	
QoTeT	(-)ʁoʃeʃ				ʁiʃeʃ	ʁoʃeʃ	
b. hitQaTeL	-itʁaʃem				-itʁaʃem		
hitQaTeT	-itχamem				-itχamem		
hitQoTeT	-itʁomem				-itʁomem		

Although at a first glance one might say QoTeT verbs are disappearing from the language, a closer look shows that this is not the case. Rather, the paradigms of a well-defined set of QoTeT verbs is becoming a mixed one, with the major pattern *i* in the PST but no change in the FUT. This state-of-affairs raises several questions:

(15) Questions about paradigmatic instability[10]
Q1. Why is there paradigmatic instability in QoTeT verbs?
Q2. Why does the paradigmatic instability target specifically the PST stem, leaving the PRS/FUT stem untouched?
Q3. Why is there no paradigmatic instability in hitQoTeT verbs?
Q4. Are both approaches equally compatible with this change?

4.2 The rationale behind paradigmatic instability

At first sight, the change in (14) is surprising. A fully-syncretic, simpler paradigm, with only one stem, is changing into a syncretic paradigm. A closer look allows one to note two other aspects of the change.

First, the innovative syncretism pattern in the minor QoTeT verbs parallels that of the major QiTeL pattern. In other words, the innovative QoTeT paradigm is more regular because, like the major pattern, it distinguishes between a PST and a PRS/FUT stem. This understanding of the change also accounts for the lack of change in hitQoTeT verbs. Since the both the major hitQaTeL and the minor hitQoTeT patterns are fully syncretic, there is no pressure for change. Through this prism, one might describe the change as *assimilation in paradigm shape*. Such a view, however, obliges one to conceive of paradigm *shapes* as grammatical objects (e.g. Maiden 2004) – a conclusion that, in my opinion, is best avoided.

[10] A fifth question, about the resistance of oTeT verbs to instability, will not be discussed here, for lack of an insightful answer. It seems that this is a case of special faithfulness to the beginning of the word.

Moreover, even this cannot be the entire story. There are two ways, not one, for the QoTeT paradigm to assimilate in shape to the the major paradigm: (i) PST QiTeT, PRS/FUT QoTeT, or (ii) PST QoTeT, PRS/FUT QaTeT. The second option, which I called FUT-innovative in section 4.1, would achieve the same goal; yet change does not occur along that path. Why? Note, in addition, that the FUT-innovative would consist of replacing the *o* of the minor pattern by the *a* of the major pattern. This is also exactly what the unattested change in hitQoTeT would consist of. If so, like "assimilation in paradigm shape", whatever is responsible for solution (ii) above being dispreferred can also explain the lack of change in hitQoTeT.

Element Theory (Kaye et al. 1985, Backley 2011) constructs all (oral) vowels from three basic elements: I, U, A. The mid vowels [o] is the result of the combination of the elements U and A. A system like Modern Hebrew, with the five vowels /i,u,a,o,e/, also allows for the combination of A and I (=[e]); but not of I and U (which in other languages results in front rounded vowels like [y]). This perspective sheds light on the ongoing change in the QoTeT paradigm: since the vowel /o/ contains the vowel /a/, a stem of the type /ʁoʃeʃ/ in the QiTeL PRES/FUT or in hitQaTeL can be regarded as non-problematic. In contrast, since the elemental make-up of /o/ does not contain /i/, a PST stem QoTeT cannot be regarded as realizing the vocalization of the major pattern. This view therefore answers the first three questions above. There is instability in the PST stem of QoTeT verbs because their /o/ vocalization cannot be regarded as realizing the /i/ of the major pattern (Q1); in turn, the PRES/FUT stem and all hitQoTeT verbs *can* be regarded as corresponding to the general pattern, so they do not pose a problem (Q2,3). Importantly, this rationale does not require admitting paradigm shapes as exerting any pressure.

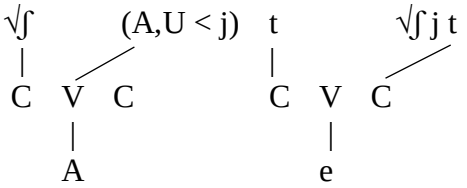
The fourth question, regarding the compatibility of the *pro/no-root* approaches with this view, is discussed next.

4.3 How the logic behind instability can be formalized in the two approaches

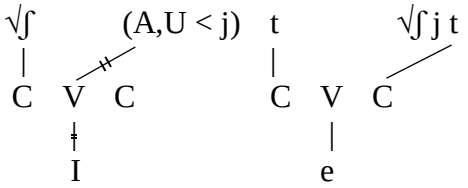
The rationale provided in the preceding section is easily formalized by the pro-root account presented earlier. Consider again the representation of *ʃotet* 'wander'. In the PRES/FUT stem (16a), when the radical /j/ is transformed into /o/ – i.e., the set <A,U> – it can be combined with the general vocalization /a/, which consists of the element A. But the element U of the <A,U> allomorph is antagonistic with the PST vocalization I in (16b). The two cannot combine; either one or the other will be realized, hence the variation.

(16) The radical /o/ can combine with PRES/FUT, but not with PST I

a. PRES/FUT [-ʃotet]



b. PST [ʃitet]~[ʃotet]



The analysis of hitQoTeT would be identical to (16a): the general vocalization A is combined with the root-specific allomorph <A,U>, so no change is expected.

At first sight, the *no-root* approach is less compatible with the analysis above, because in it, PST /ʃotet/ does not "contain" /i/. However, upon a closer look there is a sense in which it does.

In Faust (2012), I proposed a set of realization rules that covers the entire verbal system of MH. Two aspects of that account are relevant for the present discussion. First, V_1 and V_2 of verbal templates are exponed separately. Second, following an original idea by Dor (1995), /a/ is the default vowel in the system, inserted in positions for which no other information is available.

In (17), I reproduce the proposed realization rules. (17a) expresses the default status of /a/ in both positions – it is the realization of the verbal category. The rule in (17b) defines the QiTeL, hitQaTeL classes (B4,5). (17b) overrides (17a), because it is more specific (it targets not all verbs, but a subset of them). But (17b) specifies only the realization of V_2. (17c) further specifies the realization of B4 in the context of the PST feature as having a V_1 /i/. Thus, the past stem of B4, QiTeL, is specified both for V_1 and V_2, and therefore involves no *a*. There is no specific rule for PRES/FUT exponence, so the PRES/FUT form resorts back to the default *a* to yield -QaTeL. This is also the only stem of B5 (hitQaTeL), to which (17c) does not apply.

(17) The relevant Realization rules of Faust (2012)[11]

a. V	⇔	Q/a/T/a/L	
b. B4,5	⇔	QT/e/L	
c. B4	⇔	Q/i/TL	/ PST
d. B5	⇔	/hit/QTL	

Let us suppose that the rules in (17) are the redundancy rules that the *no-root* approach relies on. An entry like /digem/ is checked against them, to see what class it belongs to. While it lacks the default markers /a/ of (17a), it is recognizable as a B4 (QiTeL) verb through (17b) and a PST stem as per (17c).

Similarly, a stored stem /ʃotet/ is recognized as a B4 verb through (17b) – this is the "good enough" idea of section 3.2 above. For the PRES/FUT stem, there is no specified vowel, so the expected vowel is the default /a/ as per (17a). Since that vowel is contained within /o/, that demand is complied with; again, somehow /o/ is again "good enough" for a target requiring /a/.[12] However, /ʃotet/ deviates from the B4 pattern by not complying with (17c). This creates a conflict: the entry has a specified vowel that conflicts with the vowel of the redundancy rule. Presumably, this conflict would lead to the attested variation.

If this reasoning is acceptable, then the *no-root* approach is also compatible with the phonological rationale proposed for the change in the QoTeT paradigm. That said, note that it is necessary to somewhat extend the notion of "good enough". Besides recognizing the general /e/ in the stem /ʃotet/, the analysis involves the identification of /a/ *within* the /o/ of the PRES/FUT. This again stresses the inelegant need for the double-checking of verbal stems, both upon lexicalization and through redundancy rules. Consider, for instance the noun /semel/ 'symbol'; and assume – with Bat-El (2003) – that denominal verbs aim to preserve as much as possible of the base. If /semel/ is allowed to "survive" until the the application of redundancy rules in (17), then it is predicted to remain unaltered in the PRES/FUT stem because /e/, like /o/,

[11] For Borer (2013), vocalization is never the realization of a given verbal type, but of a higher exoskeletal node ExS. This view is in principle compatible with the rules of Faust (2012), though the specific formalization of the rules might have to be changed. For a third view, see Kastner (2019).

[12] Alternatively, one may consider that since /a/ is default, and /o/ is a part of the entry, then /a/ is not even considered. Taking this view would imply another, non-phonological rationale behind the attested pattern. Incidentally, the *pro-root* approach is also compatible with that rationale, as far as I can tell. The rules in (17) can be regarded as the realization rules in the sense of e.g. Distributed Morphology; then, the insertion of /a/ would be blocked, because of its default status, whereas that of /i/ would come into conflict with the root vowel, yielding variation.

contains /a/. Yet this is not the case: the verb 'symbolize' is *simel*, PRES/FUT *-s**a**mel*. Again, the need arises to block the legitimacy of such stems as entries before the application of redundancy rules, this time even if their vocalization is contained within that of one target verbal class: /semel/ must be found illegitimate, and changed to /simel/, upon lexicalization. I assert that such problems do not arise in the pro-root approach, which attributes the /o/ of QoTeT to the root.

This second part of the paper showed that the migration reported for QoTeT verbs is limited to past stems in the QiTeL class. A phonological reason was proposed: other stems – QiTeL PRES/FUT and hitQaTeL – are expected to involve an /a/ as their first vowel, and the exceptional /o/ of QoTeT stems can be regarded as complying with this requirement. Both the *pro-root* and the *no-root* approaches are compatible with this view, although in somewhat different ways. Arguably, the *pro-root* approach does so more elegantly.

4 Conclusion

In this paper, I presented two competing approaches to Semitic Morphology, which I called *Pro-root* and *No-root*. Both approaches have been elaborated in the past to account for general aspects of the Semitic system, like the templatic verbal classes and grammatically-significant vocalization.

Formal approaches can be evaluated by examining to what extent they can cover data that was not under their initial purview. Here, I took up the task of examining how either approach can account for the facts pertaining to a relatively minor group of verbs, characterized by an exceptional /o/ in the first syllable of the stem. Two aspects of such verbs were discussed: (i) their distribution among verbal classes and sub-classes, and (ii) the variation in vocalization exhibited by some of these verbs.

I claimed that the *pro-root* approach easily covers the distributional facts. The *no-root* approach, in turn, fails doubly in this domain: not only can it not cover these facts, it also makes wrong predictions about possible words. These shortcomings can be amended by claiming that the regularities are arbitrarily-learned historical remnants which do not require a synchronic account. If that is the case, however, proponents of this approach would have to explain what exactly changed between the preceding stage, where the regularities were not arbitrary, and the present stage. Absent such an account, the *no-root* approach is clearly less explanatory in this domain.

As for the variation in this special class of verbs, I showed that it was limited: it only occurs if the parallel canonical form exhibits a vowel that cannot be combined with /o/. While both approaches are able to express this phonological rationale, it requires the *no-root* approach to assume a "good enough" approach to vocalization that leads to some redundancy in its formal apparatus.

Even though I tried to remain objective all along the process of writing this article, it is not hard to see towards which approach my heart (or mind) leans. I hope this paper encourages proponents of the *no-root* approach to make their account of patterns like the one discussed here more explicit, and show why their approach is in fact not problematic.

References

Backley, Phillip. 2011. *An Introduction to Element Theory*. Edinburgh: Edinburgh University.

Bat-El, Outi. 1994. Stem Modification and Cluster Transfer in Modern Hebrew. *Natural Language & Linguistic Theory* 12 (4): 571–96

Bat-El, Outi. 2002. Semitic verb structure within a universal perspective. In J. Shimron (ed.), *Language Processing and Acquisition in Languages of Semitic, Root-based, Morphology*, 29-59. Amsterdam: John Benjamins.

Bat-El, Outi. 2003. The fate of the consonantal root and the binyan in Optimality Theory. *Recherches Linguistiques de Vincennes* 32:31-60.

Bat-El, Outi. 2004. Parsing forms with identical consonants: Hebrew reduplication. In D. Ravid and H. Bat Zeev Shyldkrot (eds), *Perspectives on Language and Language Development*, 25-34. Dordrecht: Kluwer.

Borer, Hagit. 2013. *Taking Form: Structuring Sense Volume III*. Oxford: Oxford University Press.

Dor, Danny. 1995. Deriving the Verbal Paradigm of Modern Hebrew: A constraint-Based Approach. In van der Hulst, H. and van de Weijer, J. (eds.) *Leiden in Last: HIL Phonology Papers I*. The Hague: Holland Academic Graphics. 105-144.

Enguehard, Guillaume and Noam Faust. 2018. Guttural ghosts in Modern Hebrew. *Linguistic Inquiry* 49 (4), 685–721.

Faust, Noam. 2012. Non-concatenative realization in the verbal inflection of Modern Hebrew. *Morphology* 22,4: 453-484.

Faust, Noam. 2015. A novel, combined approach to Semitic word-formation. *Journal of Semitic Studies* 60,2:287–316.

Faust, Noam. 2019. Paradigm Migration in the QoTeT verbs of Modern Hebrew. Poster presented in IsMo 2019, Paris, September 2019. Available online: link.

Faust, Noam and Yaar Hever. 2010. Empirical and Theoretical Arguments for the Discontinuous Root in Semitic. *Brill's Annual of Afroasiatic Languages and Linguistics* 2:80–118.

Izre'el, Shlomo. 2009. Constructive Constructions: Semitic Verbal Morphology and Beyond. In Goldenbergn G. and Ariel Shisha-Halevy (eds.) *Egyptian, Semitic and General Grammar: Workshop in memory of H. J. Polotsky*. Jerusalem: The Israel Academy of Sciences and Humanities. 106-130.

Kastner, Itamar. 2019. Templatic morphology as an emergent property. *Naturql Language and Linguist Theory* **37,** 571–619.

Kaye, Jonathan, Jean Lowenstamm, and Jean-Roger Vergnaud. 1985. The internal structure of phonological representations: a Theory of Charm and Government. *Phonology Yearbook* 2:305–328.

Maiden, Martin. 2004. Morphological autonomy and diachrony. *Yearbook of Morphology*. 137–175.

McCarthy, John. J. 1981. A prosodic theory of nonconcatenative morphology. *Linguistic Inquiry* 12,3:373–418.