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IN SEARCH FOR THE ROOTS OF THE C-ROOT: THE ESSENCE OF SEMITIC MORPHOLOGY

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A: Morphological and phonological evidence for the $C\mbox{-}\mathrm{Root}$

- (1) a. The following paradigm of Modern Hebrew verbs, accompanied by some nouns, suggests a morphemic distinction between C-roots and patterns (binyan/mishkal):
 - i. Verbs and nouns sharing a C-root also share a core semantic property (sort of).
 - ii. Verbs or nouns sharing a pattern are structurally identical in terms of prosodic structure, vocalic pattern and affixes, which together form a binyan (for verbs) or mishkal (for nouns).¹

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Patt	C-root term	{klt}	{sgr}	{kns}
B1	CVCVCV	kalat	sagar	
		'absorb, receive'	'close, shut'	
B2	niCCVC	niklat	nisgar	nixnas
		'be absorbed/received'	'be closed, shut'	'enter'
B 3	hiCCiC	hiklit	hisgir	hixnis
		'record'	'extradite'	'put in'
B4	CiCeC			kines
				'gather'
B5	hitCaCCeC		histager	hitkanes
			'shut oneself away'	'assemble'
Ν	CiCuC			kinus
				'convention'
Ν	CéCeC	kélet	séger	kénes
		'input'	'occlusion'	'conference'
N	CCiCa	klita	sgira	knisa
		'absorption'	'closing'	'entrance'

- iii. Classical conclusion: The C-root is a morpheme and the binyan (or mishkal) is a morpheme. McCarthy (1981) further divides the binyan into two morphemes, the prosodic template and the vocalic pattern.
- iv. This view, although widely acceptable, is not uncontrovertial. Quite a few scholars argue against the C-root, or simply ignore it (see appendix).
- b. i. It is implicit in this view that words must be "exclusively" decomposed into morphemes. That is, in a word *abcde*, if *ab* is a morpheme then *cde* is also a morpheme (or two morphemes). Considering *cranberry*, for example, since *berry* is a morpheme, *cran* must be a morpheme as well.
 - ii. It is also implicit in this view that relations between words are expressed in terms of the shared property and not the distinct property. That is, "the signs and are related because they have the same shape" rather than "the signs and are related because the only thing the do not share is the color". Actually, relation between words is expressed negatively in case of truncation (see Bat-El 2001). In Papago, the final consonant is truncated in the derivation of perfective from the imperfective, and therefore the perfective and imperfective are related because the only thing they do not share is the final consonant.

¹ See Doron (1999) for possible semantic relations within the verb's derivational paradigm.

- (2) The Obligatory Contour Principle (OCP), which prohibits adjacent identical segments, serves as a phonological argument in favor of the morphemic status of the C-root.
 - a. According to Greenberg's (1950) survey there are no Semitic stems where the first two consonants are identical or homorganic (*gagar, *gakar).²
 - b. McCarthy (1981) attributes this restriction to an OCP effect on place features. Since the OCP refers to adjacent segments, and since it affects only non-affixal consonants, the consonants must be adjacent. The consonants are adjacent in the C-root, before they combine with the binyan/mishkal, and therefore there must be a C-root.
 - c. However, other languages display cooccurrence restrictions on non-adjacent consonants in the stem (as well as between stem and affixes).
 - i. Japanese prohibits two voiced obstruents within a stem (Lyman 1894).
 - ii. Attic Greek prohibits two aspirated consonants within a stem (Grassman's Law; Steriade 1982). This prohibition is also found in Emakhuwa, a Bantu language spoken in Mozambique (Charles Kisseberth p.c.).
 - iii. Arusa, a Nilotic language spoken in Tanzania, prohibits two labial plosives and two palatal plosives within a stem (Levergood 1987).
 - d. The cooccurrence restrictions do not serve as an argument for the C-root. They do not characterize Semitic-type morphology; they are a phonological property found different languages (see also Bat-El to appear).
 - i. The (non-local) adjacency between the stem consonants in a Semitic language is identical to that between vowels in languages exhibiting vowel harmony.
 - ii. Non-local adjacency can be analyzed on pure phonological grounds with reference to phonological rather than morphological units.

• Within the framework of Feature Geometry vowels and consonants appear on distinct "phonologically-based" tiers, allowing non-local adjacency between vowels on one tier and consonants on the other.

• The OCP may refer to a plane, where both the segments and their prosodic units are adjacent (local adjacency) or just to the consonantal tier (non-local adjacency).

• Since non-local adjacency is more general, a language which prohibits non-local adjacency ($^{*}VC_{i}VC_{i}$) also prohibits local adjacency ($^{*}VC_{i}C_{i}V$), but not vice versa.

Local Adjacency



Non-local Adjacency

V	C V	V Ç
		t
	r	r
a	8	1

² From Allony (1969), an edited version of *Ha?egron* written in 902 by Rav Se¿adya Ga÷on, it can be learnt that this issue had already been raised by the earlier grammarians, who devided the consonants into groups (which correlate with current division on the basis of place of articulation) indicating the impossible sequences of consonants (which correlate with cooccurrence restrictions). It should be noted, however, that the discussion refers to written letters rather than to speech sounds, and due to the consonantal writing system it appears to make reference to root consonants.

B: THE ESSENCE OF SEMITIC MORPHOLOGY I

- (3) a. A typical Semitic verb must have a specific shape, defined in terms of
 prosodic structure and
 vocalic patterns (plus affixes) The set of prosodic and vocalic restrictions, which delimit the shape of a verb is the binyan.
 - b. Derivational and inflectional relations between words thus amount to alternations in prosodic structure and vocalic pattern (as well as affixation). These are the only relevant structural properties of Semitic morphology.
 - c. The C-root does not have any function, and it also does not hold any property.
 - i. A common description of Semitic morphology goes as follows: "The verbal root is usually triconsonantal, occasionally quadriconsonantal..." (Steiner 1997).
 - ii. When considering the C-root, this number is rather arbitrary as there is no reason why it should usually have three/four consonants and not five.
 - iii. This number is not at all arbitrary when considering the template. I have argued in Bat-El (1994) that the number of consonants in the stem is simply an outcome of syllable structure constraints. Given a disyllabic stem (templatic restrictions a binary syllabic foot), there is a strong preference for syllables with no complex onset or coda (thus at most four consonants CVC.CVC), and also syllables without a coda except in word final position (thus at most three consonants CV.CVC). Restrictions against complex onset and coda are universal, and stem final consonant are also claimed to be universal.

C: Semitic properties in non-Semitic languages

- (4) Morphologically conditioned prosodic and segmental restriction can be found in non-Semitic languages as well.
 - a. Prosodic restrictions Mandarin Chinese (Duanmu 1998) Maximal size - a syllabic foot; most words are disyllabic³ Minimal size - a moraic foot; there are no words smaller than a heavy syllable
 - b. Segmental restrictions Hua (Papua New Guinea; Haiman 1998) Verb stems may end only in *i*, *o*, or *u* (no *a*, *e*, or a consonant)

³ Duanmu (1998) reports that according to He and Li (1987), who compiled a frequency list of 3000 most commonly used Chinese words, disyllabic words dominate the vocabulary of the language.

Length	1-syllable	2-syllables	3-syllables	4-syllables	All
Count	809	2094	89	9	3000
%	27.0%	69.8%	3.0%	0.2%	100.0%

Moreover, the language manipulates various processes, such as synonymous compounding and reduplication, which enhance a monosyllabic word to a disyllabic.

- (5) Alternation in prosodic structure and vocalic pattern can be found in non-Semitic languages as well.
 - a. Alternating prosodic structure conditioned by certain suffixes: Yawelmani (an American Indian language of California; Newman 1944, Kisseberth 1969, Archangeli 1984)⁴

Root		Neutral	Affixes	Template Affixes		
		-al	-t	-inay	-?aa	
				CVC(C)	CVCVV(C)	
		'dubitative'	'passive aorist'	'gerundial'	'durative'	
caw	'shout'	caw-al	caw-t	caw-inay	cawaa-?aa-n	
cuum	'destroy'	cuum-al	cuum-t	cum-inay	cumuu-?aa-n	
hoyoo	'name'	hoyoo-al	hoyoo-t	hoy-inay	hoyoo-?aa-n	
diiyl	'guard'	diiyl-al	diiyl-t	diyl-inay	diyiil-?aa-n	
?ilk	'sing'	?ilk-al	?ilk-t	?ilk-inay	?iliik-?aa-n	
hiwiit	'walk'	hiwiit-al	hiwiit-t	hiwt-inay	hiwiit-?aa-n	

b. Alternating vocalic pattern conditioned by certain suffixes: Hua (Haiman 1998)

Fronting before -su 'Subjunctive'			Fronting before -e '3rd pr.'		
/do-su-e/	de-su-e	'let me be'	/do-su-e/	de-si-e	'let him eat'
/h u -su-e/	h i -su-e	'let me do'	/h u -s u -e/	hi-si-e	'let him do'
/bai-su-e/	bai-su-e	'let me be	/bai-su-e/	bai-s i -e	'let him be'

Lowering (o & u) before -ne '2nd pr.'			Fronting before $-e$ '3rd pr.'		
/do-gu-ne/	do-g a -ne	'you will eat'	/do-g u -e/	do-gi-e	'he will eat'
/do-gu-ne/	do-gu-ne	'we will eat'	/do-gu-e/	do-gu-e	'I will eat'

3rd pr. sg. -e triggers ablaut, but not 1st person -e

2nd pr. pl. -ne triggers lowering, but not 1st pr. pl. -ne

c. Alternating vocalic pattern without affixation

i.	English : come-	came	speak	-	spoke
	meet -	met	swim	-	swam

ii. Gta? (India: McCarthy 1983 on the basis of data from Mahapatra 1976)

Base	kitoŋ	kesu
VPattern	'god'	'wrapper worn against cold'
{aa} 'equal'	kataŋ 'being with powers equal to <i>kito</i> ŋ'	kasa 'cloth equivalent to <i>kesu</i> in size and texture'
{ua} 'different'	kutaŋ 'being other than <i>kito</i> ŋ'	kusa 'any material other than <i>kesu</i> usable against cold'

d. Thus, Non-Semitic languages exhibit phenomena similar to those found in Semitic languages, and similar phenomena deserve a unified account. By attributing these phenomena in Semitic languages to some peculiar morphological property we miss the generalization, which could otherwise be obtained.

⁴ McCarthy (1983) shows that Temiar (an Austroasiatic language spoken in Malaysia; Benjamin 1976), also exhibits templatic morphology.

D: THE ESSENCE OF SEMITIC MORPHOLOGY II

- (6) a. What is then the peculiarity of Semitic morphology?
 - i. Combination

A typical Semitic language displays both prosodic and vocalic alternation in its morphology. That is, it is the combination of these two which characterizes Semitic morphology.

ii. Degree

The morphology of a typical Semitic language displays a high degree of prosodic and vocalic alternation.

- b. i. Since the term "Semitic" pertains to genetic relations, Semitic languages may vary with respect to the degree and combination of prosodic and vocalic alternation (see Aronoff 1994).⁵
 - ii. Maltese (Borg and Azzopardi-Alexsander 1997, Hoberman and Aronoff to appear)

Perfect Imperfect **B**2 daħħal i-daħħal 'to make s.o. go in' **B5** tfarrak yi-tfarrak 'to be smashed' **B**8 (i)ntefaq yi-ntefaq 'to be spent' **B9** ħdar yi-ħdar 'to become green'

Within the inflectional paradigm there is mostly affixation.

Within the derivational paradigm there is also mostly affixation, and some prosodic alternation (lengthening, which could be considered as affixation of a mora).⁶

Derived Verb				F	Base Verb
B5	tfarrak	'to be smashed'	B2	farrak	'to smash'
B6	tbierek	'to be blessed'	B3	bierek	'to bless'
B7	(i) n dzabar	'to be gathered'	B1	dzabar	'to gather'
B8	(i)n t efaq	'to be spent'	B1	nefaq	'to spend'
B2	ħ am mar	'to make s.o. red'	B9	ħmar	'to become red'
B2	daħħal	'to make s.o. go in'	B1	daħal	'to enter'

The most frequent and productive morphology of loan-words is affixal, i.e. not within the Semitic system, but there are verbs which fit into the Semitic system. As for nouns, many Romance loan-words, like the native Semitic ones, have broken plural, but the more recent English loan-words have sound plural (i.e. non-Semitic).

iii. Modern Aramaic (Hoberman 1989, 1992)

The derivational paradigm has been reduced. First, there are only two binyanim. In addition, "[t]he binyanim have no exclusive morphosyntactic or semantic properties... There is one productive derivational relationship: basic Binyan I verbs form causative in Binyan II... Sometimes, however, a single root will appear in verbs of two binyanim, with some sort of semantic relationship but not a systematic or productive one" (Hoberman 1992:50).

The inflectional relations in each binyan involve only vocalic alternation (and affixation, for person-number-gender), with the exception of B1 Jussive. Stems must be listed since triconsonantal stems have various prosodic structures.

⁵ I would like to thank Robert Hoberman for comments regarding section (6).

⁶ The basic B1 verbs can have six different vocalic patterns: {aa}, {ae}, {ee}, {ea}, {oo}, and {ie}.

	B1	B2			
	3C's	2C's	3C's	3C's	4C's
Continuous	∫qal	marom	matxor	mba∫ol	mharhor
Preterite	∫qil	morim	motxir	mbo∫il	mhorhir
Imperative	∫qol	marim	matxir	mbaſil	mharhir
Jussive	∫aqil	marim	matxir	mba∫il	mharhir
	'take'	'raise'	'remind'	'cook'	'have libidinous thoughts'

- c. i. A total loss of vocalic alternation would result in a Semitic-Yawelmani language
 - ii. A total loss of prosodic alternation would result in a Semitic-Germanic language
 - iii. A total loss of both would result in the loss of the C-root; i.e. the C-root has no independent status. A language cannot lose its C-root because a language cannot lose what it does not have.
 - iv. A total loss of both may still allow a language to have restrictions on the possible prosodic structures (as in Japanese) and vocalic patterns (as in Hua). Aronoff (1994:160-164) reports on a native speaker of Hebrew who moved to an English speaking environment at the age of 2:6 and used at a certain stage (3:1-4:6) one prosodic structure and one vocalic pattern for verbs iCa(C)CeC (where the stem Ca(C)CeC is that of B4 infinitive/future/participle).

E: CREATIVE MORPHOLOGICAL ERRORS: EVIDENCE FOR THE C-ROOT?

(7) a. There are data drawn from the speech of children (Berman 1992 and earlier studies) and one aphasic speaker (Barkai 1980), all speakers of Hebrew, which show a misselection of the appropriate binayn. The deviant form (i.e. the error) can be an existing or non-existing verb. Both Berman and Barkai claim that these data support the existence of the C-root.⁷

1.	Children

Target form			Creative error		
nilxamim	B2	'they fight'	*mitlaxamim	B5	
			cf. mitnaskim		'they kiss each other'
hitkalef	B5	'it was peeled off'	*niklaf	B2	
			cf. ni∫bar		'it was broken'
hexbéti	B3	'I hid'	*xibéti	B 3	
			cf. miléti		'I filled'
mitgalgel	B5	'it is rolled'	megalgel	B4	'it rolls tr.'
niftaxat	B2	'it fm. is opened'	potáxat	B1	'she opens'
legadel	B4	'to raise'	ligdol	B1	'to grow'
he?elímu	B 3	'they hid'	ne?elmu	B2	'they disappeared'

⁷ I would like to thank Na'ama Friedman for discussion on aphasia.

- Target form Creative error *livto **B**1 levate **B**4 'to pronounce' cf. likro 'to read' higáti **B**3 *hagáti **B**1 'I arrived' cf. yacati 'I went out' niv(h)élet **B**2 *mitnavelet **B**5 'she is shocked' cf. mitlabéset 'she gets dressed' yi∫beru **B**1 yi∫avru **B**2 'they will break' 'they will get broken' tipag(?)i B2 tifga B1 'you fm. will be hurt' 'she will hurt' mekalkel B4 mitkalkel **B**5 'he spoils' 'it is spoiled'
- ii. Aphasic speaker (Dudu)

b. Children

- i. The derivational paradigm of Hebrew has plenty of gaps since not every verb has five forms corresponding to the five binyanim. The children's derivational paradigm has even more gaps since they are still in the process of acquiring new lexical items. As reported by Berman, until the age of 3 children have only one form for each verb. Then they start expanding their lexicon and only at this stage they exhibit, what Berman calls "creative errors".
- ii. At the moment they master a certain amount of derivational relations they can already figure out the structural restrictions on verbs (i.e. the binyanim). The strategy of the binyanim is not unfamiliar since at this stage they have already acquired the inflectional paradigm which uses the same strategy (i.e. prosodic and vocalic alternation with affixation). However, since their derivational paradigm is yet incomplete and since they do not yet know the full syntactic, often idiosyncratic property of each verb, they often use another existing verb or a "new" verb formed on the basis of an existing verb or noun.
- iii. This conforms with Berman's (1980:275) proposal that verbs such as **mi-kanes* (for *ni-xnas* 'he enters') and **mi-radem* (for *ni-radam* 'he falls asleep') are "reformulation from the infinitive form (as noted, acquired very early by children) of the 'avoided' nif?al pattern''.
- iv. Notice that at this stage children assign syntactic properties to the binyanim, ignoring the "numerous lexical exceptions and form/meaning mismatches which characterize the system" (Berman 1992). Therefore the fact that they use **mitlaxamim* where the intended meaning is 'fight each other' instead of *nilxamim* 'fight' (in a binyan which often derives passive verbs) is not necessarily due to the absence of *nilxamim* in their lexicon. It might as well be the case that *nilxam(im)* is actually used as the base for creating a verb with reciprocal meaning.

b. Dudu

- i. One may suggest that the lexicon of adult speakers consists of listed C-roots connected to binyanim, and Dudu's problem is in the connection between these two morphemes.
- ii. However, this cannot be the case since Dudu sometimes uses prefix consonants as part of the root.
 - In *niv(h)elet* the *n* is a prefix used in a position of a C-root consonant in **mitnavélet*
 - In *higati* the *h* is a prefix used in a position of a C-root in **hagati*.
- iii. Dudu, like the children, forms his verbs on the basis of other verbs or nouns. Evidence for denominalization can be drawn from Barkai's note that on a few occasions Dudu clearly showed that he is trying to access a verb via a noun.
 - haifa ... hakvisa ... xibsa et habgadim the woman ... the laundry ... laundered the cloths
 - hacayar ... buʃa... hitbayeʃ ... the painter ... shame ... was ashamed ...
- iv. Assuming that the lexicon consists of paradigms where the connection is between words, Dudu's problem is in retrieving the appropriate verb for the given syntactic context. That is, Dudu's problem, like that of the children, is syntactic. The C-root does not play a role here

v. Another case of this sort can be drawn from Xava's speech (data provided by Na'ama Friedman) which exhibits mismatch between stems and affixes, and within affixes (Xava was given sentences in one tense and was required to say them in another).

Target word		Creative error	Ν	lismatch
yi-zlol	'he will gluttonize' B1	me-zalal	prefix: stem:	participle B4 past B1
ti-kfoc	'you will jump' B1	yi-kafac-ta	prefix: stem: suffix:	future 3rd pr. past B1 future 2nd pr.
ti-stovev	'she will turn' B5	yi-stovav-t	prefix: stem: suffix:	future 3rd pr. future B5 2nd pr. fm.
soxav-im	'they carry' B1	saxav-im	stem: suffix:	past B1 participle
yi-kfoc	'he will jump' B1	ye-kofec	stem: prefix:	participle B1 future

Na'ama Friedman (p.c.) suggests that Xava, like Dudu, has syntactic problems; her speech exhibits mismatch between stems and inflectional affixes. The fact that the stems remain intact (i.e. they are all existing stems) suggests that they are available as such in the lexicon; the C-root does not play a role here.⁸

F: CREATIVE PHONOLOGICAL ERRORS: EVIDENCE FOR THE C-ROOT?

- (8) There are two studies of metathesis errors is Arabic, which aim to support the existence of the C-root. One based on slips of the tongue (Berg and Abd-El-Jawad 1996) and the other based on the speech of an aphasic (Prunet, Béland and Idrissi 2000).
 - a. Berg and Abd-El-Jawad (1996) compare metathesis in slips of the tongue in Arabic and German (as well as English). They show that metathesis in German is sensitive to syllable structure while metathesis in Arabic is not. For example,
 - i. German more position preserving errors (onset for onset and coda for coda)
 - Arabic similar degree of position preserving and position changing errors
 - ii. German more errors in onset than in coda
 - Arabic no evidence for onset preference over coda
 - iii. German more VC_{σ}] errors that [$_{\sigma}CV$ errors
 - Arabic no sequence errors at all

The authors attribute the difference between the languages to the independent representation of the C-root in Arabic. Many of the errors are produced at the stage where the C-root is placed on an independent tier (in the sense of McCarthy 1981), a stage where the syllable has not yet been assigned and therefore the errors are not sensitive to syllable boundary (this is a rather simplified version of their account).

- b. Another interpretation: The difference between the languages can be attributed to surface structure constraints.
 - i. Arabic does not have constraints on possible codas, and in the case of the relevant dialect (Jordanian) also possible consonant clusters. Since the template remains intact, any permutation of consonants would yield a possible word and often even an existing word (the study was not controlled for lexical bias).
 - ii. Restrictions on codas and possible clusters in German do not allow a "wild" permutation, as also slips of the tongue preserve the phonotactics of the language.

⁸ Dudu's speech, like that of Xava, also exhibits mismatch between stem an affixes. In *ma-naxti* (for *henaxti* 'I placed') he takes the participle form *ma-níax* and attaches the 1st pr. past tense suffix *-ti*.

- iii. Notice also that unlike German, Arabic does not have sequence errors (VC or CV) since this would result in an impossible word structure, given that the vocalic pattern, with the prosodic structure, defines the eligible words in the language.
- c. Prunet, Béland and Idrissi (2000) data are drawn from the speech of a bilingual aphasic speaker of Arabic and French. The patient has metathesis errors in Arabic (8.18%) but hardly any in French (0.33%). Also here the distinction is attributed to the independent (floating) representation of the C-root in Arabic: The patient fails to preserve the order of the consonants in the C-root when associating them with the prosodic positions (this is also a simplified version of the account).
- d. A different interpretation is also available here, based, again, on surface structure restrictions. The basic assumption is that a fully specified stem is represented in the lexicon.
 - i. In both languages there is a restriction on the precedence relation among segments (consonants and vowels).
 - ii. In Arabic, there is an additional constraint, requiring to preserve the precedence relation among the vowels. This restriction is more important that the one requiring to preserve the precedence relation among all segments since this restriction defines the possible words in the language.
 - iii. In both languages the patient preserves one restriction: In French the only restriction, and in Arabic the more important restriction. Preserving only the vocalic pattern allows the free permutation of the stem consonants. Here again, there is no direct reference to these consonants, they are just the left over. The fact that the consonants of the affixes remain intact suggests, as the authors note, sensitivity to morphological structure, which under my interpretation would be sensitivity to the distinction between affixes and stem (and not affixes and root consonants as the author claim).
 - iv. That is, I agree with the authors that the different performance with respect to metathesis is due to the distinction between the languages, but I claim that the distinction is in the restrictions on surface structure.

G. WHERE IS THE C-ROOT IN LANGUAGE CHANGE?

- (9) Word merger and word split
 - Zuckermann (1997) provides pairs of different words, which are semantically and phonolgically similar. He notes that speakers often do not notice the difference between the two similar words.

?ixsen	'to store' (iħsen)</th <th>?ixsen</th> <th>'to lodge'</th>	?ixsen	'to lodge'
?axaf	'to compel'	?akaf	'to bypass' (Saqaf)
hi∫ha	'to suspend'	hi∫?a	'to delay' (< hi∫Sa)
le∫avot	'to impart'	leha∫vot	'to compare'

- b. i. Such confusion may end up (or, for some speakers, has already ended up) in a merger of two C-roots.
 - ii. However, it has nothing to do with the similarity / identity of the C-roots; it is the phonological similarity / identity of the **entire** surface form that causes such a merger: In most pair, the verbs are from the same binyan, and in two they had the same vocalic pattern in the stem (the same is true for nouns and adjectives in the list).

c. And in the other direction, speakers often fail to recognize the relation between words sharing the same C-root, when those have different surface structure and meaning.

zarak	'to throw'	hizrik	'to inject'
xazar	'to return'	xizer	'to court'
?ibed	'to lose'	hit?abed	'to commit suicide'
nimlat	'to escape'	himlit	'to give birth (by animal)'
dovev	'to make s.o. talk'	dibev	'to dub'
?avad	'to work'	?ibed	'to process'

d. These semantic distinctions arise because a semantic change affects a word and not a C-root.⁹

zarak 'to throw'	hizrik	'to throw'	>	'to inject'
xazar 'to return'	xizer	'to turn'	>	'to court'
nimlat 'to escape'	himlit	'to help s.o. escape'	>	'to give birth'
dovev 'to make s.o. talk'	dibev	'to make s.o talk'	>	'to dub'
?avad 'to work'	?ibed	'to process by working'	>	'to process'
kalat 'to absorb'	hiklit	'to cause to absorb'	>	'to record'

Notice that words (and not C-roots) undergo semantic change. Had the C-root been some meaning-bearing item we would expect it to undergo semantic change which would affect all words connected to it. This, however, never happens.

- (10) Phonological change (free variation): Hebrew spirantization
 - a. The post-vocalic spirantization found in Tiberian Hebrew is opaque in Modern Hebrew. Stops are found after a vowel and fricatives after a consonant and in word initial position.

Post-vocalic stops	Post-consonantal fricatives	Word initial fricatives
ki b ed $(b < bb)$	hi x vir $(x < \hbar, v < w)$	viter $(v < w, t < tt)$
'to respect'	'to become pale'	'to give up'
si p er (p < pp)	hit f a∫el (loan)	firgen (loan)
'to tell'	'to be embarrassed'	'not to begrudge'
si k em (k < kk)	hit x il (x < \hbar)	x ipes $(x < \hbar, p < pp)$
'to summarize'	'to start'	'to search'

b. Opacity has resulted in a great degree of free variation (Adam to appear) which can be accounted for by paradigm leveling (the "new" non-standard forms are in bold).

Past	Participle	Future	
safar	sofer	yispor ~ yis<u>f</u>or	'to count'
∫avar	∫over	yi∫bor ~ yi∫<u>v</u>or	'to break'
katav	kotev	yixtov ~ yi<u>k</u>tov	'to write'
kibes ~ <u>x</u> ibes	mexabes	yexabes	'to launder'
pisel ~ <u>f</u> isel	mefasal	yefasel	'to sculpture'
bitel ~ vitel	mevatel	yevatel	'to cancel'

⁹ I would like to thank Ghil'ad Zuckermann for his help here.

c. Free variation is a sign of a change. Paradigm leveling affects a stem consonant and may thus suggest a change in the C-root. It is thus expected that all words sharing the same C-root will undergo the same change. This, however, is not correct. Paradigm leveling hardly ever goes beyond the verb paradigm and it is usually restricted to the inflectional paradigm.

Past	Participle	Future		Noun/Adj.	
safar	sofer	yispor ~	'to count'	mispar	'number'
		yis <u>f</u> or		*mis <u>f</u> ar	
zaxar	zoxer	yizkor ~	'to remember	zi <u>k</u> aron	'memory'
		yiz <u>x</u> or		*zi <u>x</u> aron	
katav	kotev	yixtov ~	'to write'	mi <u>x</u> tav	'letter'
		yi <u>k</u> tov		*mi <u>k</u> tav	
nix∫al	nix∫al	yika∫el ~	'to fail'	ki∫alon	'failure'
		yi <u>x</u> a∫el		* <u>x</u> i∫alon	
pi∫et ~	mefaſet	yefaſet	'to simplify'	pa∫ut	'simple'
<u>f</u> i∫et				* <u>f</u> a∫ut	

i. Nouns sharing the same C-root are never affected

ii. In most cases related verbs sharing the same root are not affected either.

Past	Participle	Future	
sa <u>x</u> ar	so <u>x</u> er	yis <u>k</u> or ~ yis<u>x</u>or	'to rent intr.'
his <u>k</u> ir	mas <u>k</u> ir	yas <u>k</u> ir	'to rent tr.'
lava∫	love∫	yil <u>b</u> a∫ ~ yil⊻a∫	'to wear (cloth)'
hil <u>b</u> i∫	mal <u>b</u> i∫	yal <u>b</u> i∫	'to dress tr.'
kafac	kofec	yikpoc ~ yik<u>f</u>oc	'to jump'
hikpic	makpic	yakpic	'to bounce'
bitel ~ vitel	mevatel	yevatel	'to cancel'
hit <u>b</u> atel	mit <u>b</u> atel	yit <u>b</u> atel	'to be canceled'

iii. Occasionally, regardless of paradigm leveling, a verb in one binyan may adopt the surface consonantism of a related verb, if their semantic relation is entirely compositional (mostly B1-B2 and B4-B5).

Past	Participle	Future	
?i <u>b</u> ed	me?a <u>b</u> ed	ye?a <u>b</u> ed	'to lose'
ne?evad	ne?evad	ye?aved	'to be lost'
ne?e <u>b</u> ad	ne?e <u>b</u> ad	ye?a <u>b</u> ed	
<u>k</u> isa ~ xisa	me <u>x</u> asa	ye <u>x</u> ase	'to cover'
hit <u>k</u> asa	mit <u>k</u> ase	mit <u>k</u> ase	'to be covered'
hit <u>x</u> asa	mit <u>x</u> ase	mit <u>x</u> ase	
pirek ~ firek	mefrek	yefarek	'to take apart'
hitparek	mitparek	yitparek	'to fall apart'
hit <u>f</u> arek	mit <u>f</u> arek	yit <u>f</u> arek	

Notice that *hitparek* has a colloquial meaning 'to relax' which never undergoes paradigm leveling, i.e. while *hitparek* means both 'to fall apart' and 'to relax' *hitfarek* means only 'to fall apart'.

- (11) The lexicon as a paradigm
 - a. The lexicon consists of paradigms. There are loose and tight relations between words in the paradigm, based on semantic and phonological transparency. A word may independently undergo semantic change, which may cause a tight connection to become loose and a loose connection to disappear completely. A semantic change affecting a base (which by itself could be derived) may also affect a tightly related (derived) word.
 - b. Accessibility to the entire paradigm in the course of derivation has been recently argued in Steriade (1999, 2001).
 - i. English *compéns-able* has two bases: Phonological base: *compénsatory* (from which the stress is drawn) Morphosyntactic base: *cómpensate* (which license *-able*)
 - ii. Romanian Agentives
 - The gerund is the source of the stem

Agentive	Gerund	Infinitive	
ut∫ig-∧tór	ut∫ig-nd	ut∫íd-e	'kill'

• The infinitive is the source of the theme vowel

Agentive	Gerund	Infinitive	
арлг-л-tór	арлг-í-nd	арлг-а́	'defend'
hotär-i ⁻ -tór	hot∧r-í-nd	hotʌr-i	'decide'

- (12) Conclusion
 - a. Semitic-type morphology is characterized by structural constraints on the surface representation referring to the combination of prosodic structure, vocalic pattern and affixation.
 - b. Given the reference to these structural properties, the C-root is just the residue. There is no direct referent to the C-root, and therefore it does not exist. And indeed, wherever we look we do not find a C-root effect.
 - c. Only the assumption that words are exclusively composed of morphemes may lead to the conclusion that, by virtue of being a residue the C-root is also a morpheme. But this is not a necessary assumption.

APPENDIX: SOME STUDIES IGNORING OR ARGUING AGAINST THE C-ROOT

- a. Brockelmann (1908) claims, according to Troupeau (1984), that the root is nothing but an abstraction that has the benefit of making the ordering of vocabulary easier (and he does not talk about the mental lexicon). In Brockelmann's view, the concept of root is unserviceable for morphology, which should start off with forms of words that had, or still have their own existence.
- b. Gray (1934), in his book *Introduction to Semitic Comparative Linguistics*, does not mention the C-root. Originally an Indo-Europeanits, he provides a stem-based analysis. "Verbs possess a number of categories ('stems') expressed by various modifications of the base both internal (vocalic alternations, gemination of the second consonant) and external (prefixes)" (p.76). Vocalic and prosodic alternations are expressed by alternation grades: P(rolonged), F(ull), R(educed), V(anishing), and Z(ero):

base:	qa	tal

FF	qatala	'to kill'
PF	qa:tala	'to fight'
FP	qata:lun	'weapon'
FΖ	qatlun	'act of killing'
ZP	?a-qta:lun	'enemies'
ZF	?a-qtala	'expose to death
~		

That is, for Gray a Semitic language has the same type of morphology as Latin.

- c. Kuryłowicz (1972) in his book *Studies in Semitic Grammar and Metrics* explicitly claims that "[I]t would be erroneous to consider the root of the Sem. verb as a merely consonantal skeleton" (p. 34). Kuryłowicz assumes a CCVC root "whose vocalism ... is basic or unpredictable; the rest of the conjugation may be inferred owing to certain well-defined laws of Sem. apophony (vowel- gradation, ablaut)" (ibid).
- d. Lipiński (1997) claims that "... Semitic roots are continuous morphemes ... subject to vocalic and consonantal change".
- e. Guerssel and Lowenstamm (1993) and Lowenstamm (2000) for apophony in Arabic assume bases with consonants and one vowel.
- f. McCarthy and Prince (1990) and Ratcliffe (1997) for Arabic broken plurals, and Rose (1998) for Tigre frequentative reduplication word-based derivation.
- g. Heath (1987) for Moroccan Arabic, Horvath (1981), Bat-El (1994, to appear) and Ussishkin (1999, 2001) for Modern Hebrew, and Benmamoun (2000) for Arabic word-based morphology with explicit arguments against the C-root.
- h. Zawaydeh and Davis (1999) for Arabic hypocoristics refer to an extracted C-root but can do well without it.

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