Roots and Correspondence: Denominal Verbs in Modern Hebrew

Adam Ussishkin
University of California, Santa Cruz

1 Introduction

Modern Hebrew exhibits a derivational process known as *Denominal Verb Formation* (DVF) whereby a base form, usually a noun, may become a verb. This process has been analyzed by several researchers (Bat-El 1994, Gafos 1995, Sharvit 1994) but to date a comprehensive, principled account has not been proposed. In this paper, it is my aim to present such a principled account of DVF, within Optimality Theory (Prince & Smolensky 1993). This account crucially relies on the consonantal *root*, arguing against the proposal of Bat-El (1994) that the root plays no role in DVF.

In addition, I propose to capture the well known effects of left-to-right spreading attested throughout Semitic (McCarthy 1979, 1981, et seq.) using a new form of Anchor constraints. These new Anchor constraints will be useful in accounting for cases of consonant doubling, which is attested in a subset of Modern Hebrew denominal verbs. Finally, I show that Bat-El's (1994) arguments against the consonantal root can be recast as reasons to adopt a separate dimension of correspondence relations in the analysis: namely, the dimension of Output-Output Correspondence, following work of, e.g., Benua (1995, 1997) and Burzio (1996).

2 Data

All denominal verbs in Modern Hebrew are bisyllabic. However, within this set of verbs there exists an interesting variation. The range of denominal verbs in Modern Hebrew may be divided into two sets: biliteral forms (forms whose bases contain two consonants), and forms with three or more consonants.

2.1 Biliteral forms

Biliteral denominal verbs exhibit a variation in possible surface patterns. As seen in (1), consonant doubling involves copying the second base consonant.

(1) $C_1iC_2eC_2$ (consonant doubling)

	Base	*Gloss*	*Denominal verb*	*Gloss*
(a)	dam	'blood'	dimem	'to bleed'
(b)	xad	'sharp'	xided	'to sharpen'
(c)	mana	'portion'	minen	'to apportion'

Consider now the forms in (2), which involve the epenthesis of the palatal glide [j] as the medial consonant in the related denominal verbs.

(2) C_1iyeC_2 (glide epenthesis)

	Base	*Gloss*	*Denominal verb*	*Gloss*
(a)	bul	'stamp'	bijel	'to stamp'
(b)	gis	'column, corps'	gijes	'to conscript'
(c)	buΣa	'shame'	bijeΣ	'to put to shame'

The final case involving biliteral bases is what I term total reduplication. As shown in (3), here we find two copies of each base consonant in each denominal verb.

(3) $C_1iC_2C_1eC_2$ (total reduplication)

	Base	*Gloss*	*Denominal verb*	*Gloss*
(a)	kav	'line'	kivkev	'to draw a dotted line'
(b)	nim	'sleepy'	nimnem	'to doze'
(c)	mila	'word'	milmel	'to gabble'

2.2 Cluster Transfer Effects (≥3-literal forms)

The second class of denominal verbs have more than three consonants in their related bases. These forms typically involve consonant clusters, which, as pointed out originally by Bat-EL (1994), are usually preserved. This is illustrated below, in (4)-(8). Note that the only exception to the generalization regarding cluster preservation is the form in (4).

(data from Bat-El 1994)

(4)	*Base*	*Gloss*	*Denominal verb*	*Gloss*
	blof	'bluff'	bilef	'to bluff'

(5)	*Base*	*Gloss*	*Denominal verb*	*Gloss*
	faks	'facsimile'	fikses	'to send a fax'

(6)	*Base*	*Gloss*	*Denominal verb*	*Gloss*
(a)	praklit	'lawyer'	priklet	'to practice law'
(b)	Σravrav	'plumber'	Σrivrev	'to plumb'

(7)	*Base*	*Gloss*	*Denominal verb*	*Gloss*
(a)	guΣpanka	'seal'	giΣpenk	'to seal'
(b)	nostalgia	'nostalgia'	nistelg	'to be nostalgic'

(8)	*Base*	*Gloss*	*Denominal verb*	*Gloss*
(a)	transfer	'transfer'	trinsfer	'to transfer'
(b)	streptiz	'striptease'	striptez	'to perform a striptease'

Bat-El (1994) notes that in Modern Hebrew, these verbs could have surfaced with clusters that differ from those in their bases if such clusters do not violate the Sonority Sequencing Principle (SSP); e.g., *[pirklet] instead of [priklet]; but such forms are never attested; consonant clusters are always preserved (except for (4)). These facts are taken by Bat-El as evidence against the consonantal root, a unit traditionally given morphemic status in all Semitic languages. Bat-El argues, however, that if DVF simply involved extraction of root consonants from a base noun, information regarding adjacency of consonants in the base is lost. Cluster preservation, for Bat-El, therefore, suggests that no consonantal root is extracted, and that the base forms themselves serve as the inputs to DVF. Rather than adopt this approach, I claim that DVF is dependent on the consonantal root. My OT analysis will account for cluster preservation through a high-ranking Output-Output Correspondence constraint on CONTIGUITY.

3 OT Analysis

In this section I present my OT-based analysis of DVF. I will first provide an account of consonant doubling, through the use of special Anchor constraints I dub "Strong-Anchor". These constraints explain why it is always the right consonant that gets copied (a phenomenon that is widespread throughout the Semitic language family).

3.1 Consonant doubling

In order to satisfy constraints on the shape of stems in Hebrew, denominal verbs may opt for a range of patterns. The first of these that we have seen is consonant doubling. However, if we start with a base noun that has two consonants, and we are compelled to double one of these, it is only the rightmost consonant that may double. In order to account for this I propose a new set of Anchor constraints, based on McCarthy & Prince's (1995) original conception of Anchoring, which is presented below in (9), along with a table illustrating its satisfaction and violation.

(9) ANCHOR-L(EFT)

$[(x = \text{Edge}(S_1, L))\ \&\ (y = \text{Edge}(S_2, L))] \rightarrow [x\Re y]$

where "$x\Re y$" means "x and y are in a correspondence relation."

ANCHOR-L satisfied:	ANCHOR-L violated:
S_1: $[_L\ \mathbf{b_1}\ a_2\ d_3\ u_4\ p_5\ i_6\ ]_R$	S_1: $[_L\ \mathbf{b_1}\ a_2\ d_3\ u_4\ p_5\ i_6\ ]_R$
S_2: $[_L\ \mathbf{b_1}\ a_2\ d_3\ u_4\ p_5\ i_6\ ]_R$	S_2: $[_L\ a_2\ \mathbf{b_1}\ d_3\ u_4\ p_5\ i_6\ ]_R$

I propose a new set of Anchoring constraints, which have stronger prohibitions than normal Anchoring. I term this new constraint STRONG-ANCHOR. Its definition is given in (10), and is followed by an illustrative table.

(10) S(TRONG)-ANCHOR- L(EFT)

$[(x = \text{Edge}(S_1, L))\ \&\ (x\Re y)] \rightarrow [y = \text{Edge}(S_2, L)]$

S-ANCHOR-L satisfied:	S-ANCHOR-L violated:
S_1: $[_L\ \mathbf{b_1}\ a_2\ d_3\ u_4\ p_5\ i_6\ ]_R$	S_1: $[_L\ \mathbf{b_1}\ a_2\ d_3\ u_4\ p_5\ i_6\ ]_R$
S_2: $[_L\ \mathbf{b_1}\ a_2\ d_3\ u_4\ p_5\ i_6\ ]_R$	S_2: $[_L\ \mathbf{b_1}\ a_2\ \mathbf{b_1}\ d_3\ u_4\ p_5\ i_6\ ]_R$

(10) states that for an input-initial element, *every* correspondent of that element must be initial in the output. Doubling of input-initial elements is prohibited by S-ANCHOR-L. Let's now reconsider the Hebrew data, where we have seen that in the cases of consonant doubling, the rightmost consonant doubles. This is evidence that in addition to S-ANCHOR-L, we also need a (violable) constraint prohibiting input-final elements from doubling:

(11) S-ANCHOR-R(IGHT)

$[(x = \text{Edge}(S_1, R))\ \&\ (x\Re y)] \rightarrow [y = \text{Edge}(S_2, R)]$

(11) is the mirror image of (10) in that it refers to right edges instead of left edges. The ranking in (12), which I propose is universal throughout Semitic, will force doubling of the rightmost consonant whenever doubling is forced.

(12) *Ranking prohibiting initial consonant doubling and compelling final consonant doubling:*

S-ANCHOR-L » S-ANCHOR-R

3.2 What is in the input?

Of course, a crucial issue here is the input to denominal verb formation in Modern Hebrew. My claim is that the consonantal root of the base is taken as the input, as opposed to the entire base. This approach is motivated mainly by the existence of polysyllabic bases, such as [mana] 'portion' above, where the base is a CVCV sequence and the resulting verb ([minen] 'to apportion') is identical in shape to the verbs whose bases are CVC. Thus, the input consists of the consonants, as well as the verbal morphology, which consists of the vowels /i e/.

Another issue that arises in connection to the input is the bisyllabic nature of all denominal verbs. How are we to arrive at this bisyllabic output in every case? Is it truly a coincidence that the verbal morphology contributes two vowels to the input, and that the output in every case is two syllables? Previous researchers have attributed such effects to templates, whose existence has recently been questioned in general (e.g., Prince 1997, Spaelti 1997) and for Semitic (Bat-El 1994). We will see that in my analyses below the bisyllabic output is unavoidable, given the constraints appealed to. Further work is necessary to determine exactly which principles are at work in setting prosodic restrictions in DVF.

3.3 Other constraints

The analysis requires the use of the following constraints:

(13) INTEGRITY (McCarthy & Prince 1995)
No element of the input has multiple correspondents in the output.
("No copying/doubling")

(14) MAX-IO
Every element of the input has a correspondent in the output.
("No deletion")

(15) DEP-IO
Every element of the output has a correspondent in the input.
("No epenthesis")

(16) ONSET (Prince & Smolensky 1993)
Every syllable has an onset.

(17) REALIZE-M(ORPHEME) (Gnanadesikan 1997, Rose 1997, after Samek-Lodovici 1993)
Any morpheme in the input must have some realization in the output.

In (18) I illustrate the analysis of a case of consonant doubling, showing the use of two of the above constraints.

(18) [dimem] 'to bleed from base [dam] 'blood'

	d m + i e	REALIZE-M	MAX-IO
	a. dam	*!	**
☞	b. dimem		

(19) shows a tableau motivating the ranking ANCHOR-R » INTEGRITY:

(19)

	d m + i e	ANCHOR-R	INTEGRITY
	a. dime	*!	
☞	b. dimem		*

Next, we see the interaction of these two constraints with the STRONG-ANCHOR constraints.

(20) ANCHOR-R, S-ANCHOR-L » S-ANCHOR-R, INTEGRITY

	d m + i e	ANCHOR-R	S-ANCHOR-L	S-ANCHOR-R	INTEGRITY
	a. didem		*!		*
☞	b. dimem			*	*

As seen in (20), the crucial ranking between S-ANCHOR-L and S-ANCHOR-R guarantees that if doubling must take place, only root-final consonants are doubled. Why is it so imporant to refer to *root* elements here? Suppose that instead of the root, we took as input to the denominal verb the entire base form. Let us take, for instance, the form [minen] 'to apportion', whose base is [mana] 'portion'. The following tableau illustrates the problem:

(21) wrong prediction with full base [mana] as input:

	mana + i e	ANCHOR-R	S-ANCHOR-L	S-ANCHOR-R	INTEGRITY
☞	a. minen	*!			*
	b. mimen	*!	*		*
	c. mimena		*!		*
	d. mamanine	*!	*	*	**
❽	e. mananinena			*	*****

We make the right prediction, however, when just the root is taken as the input:

(22) correct prediction with root /m n/ as input:

[minen] 'to apportion' from [mana] 'portion'

m n + i e	ANCHOR-R	S-ANCHOR-L	S-ANCHOR-R	INTEGRITY
☞ a. minen			*	*
b. mimen		*!		*
c. mimena	*!	*		*
d. mamanine	*!	*	*	*
e. mananinena	*!		*	***

Returning now to [dimem], let us consider other potential candidates and how these are ruled out by ONSET and DEP-IO:

(23) ONSET, DEP-IO: undominated

d m + i e	ONSET	DEP-IO	S-ANCHOR-R	INTEGRITY
a. diem	*!			
b. dijem		*!		
☞ c. dimem			*	*

Interestingly, the analysis presented here is *contra* Gafos (1995) and Sharvit (1994) in that no reduplicative morpheme is involved in consonant doubling or in glide epenthesis. Rather, consonant doubling and glide epenthesis are both seen as ways of fulfilling a bisyllabic template without a true reduplicative morpheme. Such a morpheme will be invoked for total reduplication below, but first, let's examime how the analysis accounts for cases involving glide epenthesis.

3.4 Glide Epenthesis

I analyze cases of glide epenthesis as involving constraint reranking. As we saw above, the constraint DEP-IO must be high-ranking in the cases of consonant doubling; specifically, it must at least outrank INTEGRITY. However, in the cases of glide epenthesis, this constraint is low-ranking; specifically, it is outranked by INTEGRITY. This is because in cases where glide epenthesis is attested, it is worse to copy a consonant than to insert phonological material with no input correspondent. (24) illustrates the analysis of such forms.

(24) Glide epenthesis

[bijel] 'to stamp' from [bul] 'stamp'

b l + i e	ONSET	S-ANCHOR-L	ANCHOR-R	INTEGRITY	S-ANCHOR-R	DEP-IO
a. bile			*!		*	
b. bilel				*!	*	
c. bibel		*!		*		
d. biel	*!					
☞ e. bijel						*

Again, with the *base* as input instead of the root, we would make the wrong prediction when it comes to CVCV bases: there would be no reason for the epenthetic glide to appear were the entire base (including its vowel) to serve as input to DVF.

3.5 Total Reduplication

I now turn to cases of total reduplication. My claim here is that such forms involve an actual reduplicative morpheme (Bar-Adon 1978, Gesenius 1910, Rose 1997), in contrast to the analysis of consonant doubling and glide-epenthesis forms. The morphological content contributed by the reduplicative morpheme (RED) signifies repetitive, frequentative, or durative action. The correspondence-theoretic constraint in (25) accounts for the reduplication of *both* root consonants in such forms:

(25) MAX-BR (McCarthy & Prince 1995)
Every element of the base has a correspondent in the reduplicant.
(undominated)

The following tableau illustrates the analysis.

(26) Total reduplication

[kivkev] 'to draw a dotted line' from [kav] 'line'

k v + RED + I e	MAX-BR	REALIZE-M	S-ANCHOR-L	S-ANCHOR-R	INTEGRITY	DEP-IO
a. kivev	*!			*		
b. kijev	*!*	*				*
☞ c. kivkev			*	*	**	

As above, if we take the base instead of the root as input, we make the wrong prediction about CVCV bases.

3.6 Cluster Transfer Effects

Let us now turn to the effects of cluster preservation. Such data (given in (4) - (8) above) led Bat-El (1994) to adopt a Stem Modification analysis of denominal verbs in Modern Hebrew, whereby the base is taken as input to denominal verb formation. I propose that such cases can also be fruitfully analyzed with *roots* as inputs; the cluster transfer effects are in fact the result of Output-Output Correspondence (e.g., Benua 1995, 1997; Burzio 1996):

(27) O(UTPUT)O(UTPUT)-CONT(IGUITY)
Correspondents that are contiguous in the base are contiguous in the output; likewise, correspondents that are not contiguous in the base are not contiguous in the output.

Another constraint is also also important (and violable):

(28) *COMPLEX (Prince & Smolensky 1993)
Syllable margins (i.e. onsets and codas) do not contain more than one segment.

The following tableaux illustrate the analysis:

(29) [.flir.tet.] 'to flirt' from [.flirt.] 'flirt'

f l r t + i e related output: [flirt]	ANCHOR-R	OO-CONT	*COMPLEX	S-ANCHOR-R	INTEGRITY
a. filret		*!**			
b. flirte	*!		*		
☞ c. flirtet			*	*	*

As (29) shows, consonant clusters are robustly preserved, even at the expense of violating the constraint INTEGRITY. That is, consonant clusters are preserved even if this entails that doubling must also take place. Another example of the same type, showing the high-ranking status of our output-based constraint OO-CONT is shown in (30):

(30) [.fik.ses.] 'to send a fax' from [.faks.] 'facsimile'

fks+ie related output: [faks]	ANCHOR-R	OO-CONT	*COMPLEX	S-ANCHOR-R	INTEGRITY
a. fikes		*!			
b. fikse	*!				
☞ c. fikses				*	*

The remainder of cases involving cluster preservation all have so many consonants that doubling never takes place. Our analysis straightforwardly accounts for such cases, as illustrated in (31):

(31) [.pri.klet.] 'to practice law' from [.pra.klit.] 'lawyer'

prklt+ie related output: [praklit]	OO-CONT	*COMPLEX	S-ANCHOR-R	INTEGRITY
a. pirklet	*!*	*		
☞ b. priklet		*		

We encounter a problem, however, when we consider the CCVC bases. Recall that such cases were the only exception to the generalization that consonant clusters are preserved from base to denominal verb. (32) illustrates the problem.

(32) [.bi.lef.] 'to bluff' from [.blof.] 'bluff'

blf+ie related output: [blof]	OO-CONT	*COMPLEX	S-ANCHOR-R	INTEGRITY
☹ a. blifef		*	*	*
☞ b. bilef	*			

Under this ranking, the cluster-preserving candidate (a) will emerge the winner, even though (b) is the actual output. One suggestion is that some other constraint (as yet unformalized) mandates that onset consonants in the base must each be their own onset in the resulting denominal verb. For now, I leave this question open to future research.

4 Conclusion

To sum up, I have provided an OT account of Modern Hebrew denominal verb formation. The most important point is that we have seen that the input to denominal verbs consists of base consonants (i.e. the consonantal *root*) only.

Variation between two of the biliteral patterns (those not involving a reduplicative morpheme) is explained by constraint reranking.

Finally, we have seen that the third pattern involves a reduplicative morpheme and the undominated constraint MAX-BR. Consonant cluster transfer effects are thus captured through high-ranking OO-Correspondence, and we are left with an analysis that does not abandon the consonantal root.

5 References

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Adam Ussishkin
Department of Linguistics
University of California, Santa Cruz
Stevenson College
Santa Cruz, CA 95064
ussishki@ling.ucsc.edu