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Morphological levels and diachronic change in Modern Hebrew plural formation*

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Modern Hebrew (MH) is undergoing a change in its morphological structure. Unlike earlier periods of the language, in which all nominal suffixation processes resulted in stress shift to the suffix, MH has a few suffixes that exhibit variable behavior. When attached to canonical bases, they pattern with other suffixes in that they attract stress and may cause phonological changes to the base. When attached to non-canonical bases, they do not attract stress and cause no phonological changes to the base. Additionally, stress neutral suffixation is much more regular and productive than stress attracting suffixation in its morphology, distribution and semantics. I argue that these two different patterns can be accounted for in terms of morphological levels within the theoretical framework of Stratal Optimality Theory (Kiparsky 2000, 2002, to appear). The different phonological behavior is accounted for in terms of different ranking of two constraints, applying at stem level vs. word level. The morphological and semantic correlates are attributed to the different properties of stem vs. word-level morphology. The diachronic change, namely the activation of word level for nominal suffixation, triggered further changes in MH's morphological system: the development of several default suffixes, and the emergence of two distinct subgrammars, which differ from each other in gender assignment and the correlation between gender and inflectional class (in the sense of Aronoff 1994).

Keywords: affixation, morphological levels, Modern Hebrew, morphological changes, pluralization

1. Plural affixation in Hebrew**

Nouns in Hebrew fall into two gender classes, masculine and feminine. There is a rather strong correlation between the phonological form of a noun and its gender. The feminine is the marked gender, feminine nouns typically ending

with *-a* (e.g., *simxa* ‘happiness’) or *-ut/-it/-et/-at* (*xanut* ‘shop’, *xavit*, ‘barrel’, *rakevet* ‘train’, *calaxat* ‘plate’). Masculine nouns are unmarked: nouns lacking a feminine ending are masculine. However, this correlation is not entirely consistent. Some masculine-sounding nouns, that is nouns which do not have a feminine ending, are nonetheless feminine (e.g., *ʔeven* ‘stone’, *ʔerec* ‘country/land’, *cipor* ‘bird’), and a smaller number of nouns ending with *-a* or *-it/-et* are masculine (*layla* ‘night’, *cevet* ‘crew’, *comet* ‘junction’, *ʔamit* ‘colleague’).

Hebrew has two nominal plural suffixes: *-im* and *-ot*. Both have allomorphs: *-im* and *-ayim*¹ for the former, *-ot*, *-iyot/uyot*, and *-aʔot* for the latter. Masculine nouns usually take the *-im* suffix, and feminine nouns the *-ot* suffix.² Once again, the correlation is not entirely consistent. Ben-Or (1977, cited in Schwarzwald 2002) notes that there are about 200 masculine nouns in current use taking the *-ot* suffix, and 50 or so feminine nouns taking the *-im* suffix. Thus the choice of plural suffix cannot always be inferred from the gender of the noun. Furthermore, it cannot be reliably inferred from the phonological form of the noun: feminine-sounding nouns may take the *-im* suffix,³ and some masculine-sounding nouns take the *-ot* suffix. Hence, although “...the morphological structure along with gender marking are the main causes for the choice of the plural suffix” (Schwarzwald 1991:596), neither the gender nor the phonological structure of the base can fully predict the choice of the plural suffix (as illustrated in Table 1). The specific phonological form and the choice of plural suffix have to be stated for each noun *independently* (Aronoff 1994:78), which means that there are no general noun paradigms in the language, as is illustrated in Table 1. Therefore, gender in Hebrew is not an inflectional class (in the sense of Aronoff 1994, that is a set of lexemes whose members each select the same set of inflectional realizations).⁴

Plural formation in Hebrew is yet irregular in another way. Plural affixation usually shifts the stress to the suffix. This stress shift may result in additional phonological changes to the base. Though the Mishkal (pattern) of the singular form is a good predictor of these phonological changes (Berent et al. 1999), their occurrence is nonetheless not always predictable. For example, in

Table 1. The unpredictability of plural formation in Hebrew.

Noun gender	Regular		Irregular	
Masculine	<i>xof-xofim</i>	‘beach’	<i>kol-kolot</i>	‘voice’
Feminine	<i>ʔerec-ʔaracot</i>	‘country/land’	<i>ʔeven-ʔavanim</i>	‘stone’
Phonological form				
Masculine sounding	<i>maxfev-maxfevim</i> (m.)	‘computer’	<i>mafteax-maftexot</i> (m.)	‘key’
Feminine sounding	<i>layla-leylot</i> (m.)	‘night’	<i>nemala-nemalim</i>	‘ant’

gamad – *gamadim* (‘dwarf’) plural inflection does not alter the base, but in the phonologically similar *gamal* – *gmalim* (‘camel’), suffixation causes the deletion of a vowel in the stem.⁵ Similarly, in *xanit* – *xanitot* (‘spear’), suffixation does not change the base, whereas in *mapit* – *mapiyot* (‘napkin’), suffixation results in the deletion of the feminine marker (-*t*) of the base (Schwarzwald 1991, 601). Thus, plural formation in Hebrew is irregular in two ways: both the choice of the plural suffix (-*im* or -*ot*) and the phonological changes caused by suffixation are not reliably predictable from the phonological form or the gender of the base.⁶

2. Plural formation and stress

The regular stress pattern in Hebrew is on the final syllable, in both derived and non-derived forms (see Graf & Ussishkin 2003 and references cited there). Hence suffixation results in stress shift to the suffix, as is illustrated by the following plural forms: *sipur* – *sipurim* (‘story’ m.); *rakevet* – *rakavot* (‘train’ f.). However, there is a class of nouns in which stress does not shift to the plural suffix. This class includes words which are outside of the canonical root-and-pattern word formation structure of the core native Hebrew lexicon. It consists of the sub-classes shown in Table 2.⁷

When suffixation does not result in stress shift, there are also no accompanying phonological changes in the base. Thus, the plural of the noun *barak* (‘lightning’) is *brakim*, exhibiting the expected vowel change. But when used as a family name, its plural form is *barakim*, with no stress shift and no vowel

Table 2. Classes of nouns with no stress shift

– Borrowings	<i>student-studentim</i> (‘student’), <i>banana – bananot</i> (‘banana’)
• Words containing a borrowed affix	<i>kibucnik – kibucnikim</i> (‘a Kibutz member’ m.), <i>kibucnikit – kibucnikiyot</i> (‘a Kibutz member’ f.)
• Acronyms	<i>rabat-rabatim</i> (<i>rav-turai</i> , ‘corporal’), <i>taca-tacot</i> (<i>taclumei-ʔavir</i> , ‘aerial photographs’)
• Nouns used as proper names	<i>ʔafik – ʔafikim</i> (‘The Afik family’), <i>dina – dinot</i> (‘The Dina’s’)
• Some blends	<i>midrexov – midrexovim</i> (‘pedestrian walkway’) ^a
• Some highly lexicalized compounds	<i>kadursal – kadursalim</i> (‘basketball’)

^a Not all native speakers accept such forms. These forms are typically used by young speakers, in their twenties or younger. Older speakers are very hesitant as to the plural form of blends and lexicalized compounds, and tend to avoid pluralizing them. See Section 3 for further discussion.

Table 3. Variable suffixes

The suffix	Canonical base	Non-canonical base
feminine inflection <i>-it</i>	<i>rakdan</i> – <i>rakdanit</i> ('dancer')	<i>rabat</i> – <i>rabatit</i> ('corporal')
adjectivizing suffix <i>-i</i>	<i>ʃemef</i> – <i>ʃimfi</i> ('sunny')	<i>tel-ʔaviv</i> – <i>tel-ʔavivi</i> ('Tel-Avivan')
a derivational suffix forming abstract nouns <i>-(iy)ut</i>	<i>yeled</i> – <i>yaldut</i> ('child'-'childhood')	<i>kuter</i> – <i>kuteriyut</i> ('whiner', 'whining-ness') <i>diva</i> – <i>divaiyut</i> ('diva', 'diva-ness')

Table 4. Some uni-behavior (accented) suffixes

The suffix	Canonical word	Non-canonical word
<i>-an</i>	<i>sefer</i> – <i>safran</i> ('book' – 'librarian')	<i>solo</i> – <i>solan</i> ('solo' – 'solist')
<i>-iya</i>	<i>sefer</i> – <i>sifriya</i> ('book' – 'library')	<i>djunk</i> – <i>djunkiya</i> ('junk yard')
<i>-ai</i>	<i>ʔiton</i> – <i>ʔitonai</i> ('journal' – 'journalist')	<i>bank</i> – <i>bankai</i> ('bank' – 'banker')
<i>-on</i>	<i>yeled</i> – <i>yaldon</i> ('boy' – 'small child')	<i>traktor</i> – <i>traktoron</i> ('tractor' – 'dune buggy')

change (Berent et al. 1999:31).⁸ Plural suffixation, then, applies very differently to canonical vs. non-canonical words. In the former, the plural suffix is stress-attracting, and suffixation results in stress shift, which may be further accompanied by phonological changes to the base. In the latter, stress does not shift to the plural suffix, and suffixation does not cause phonological changes to the base.

The plural suffixes are not the only suffixes in the languages exhibiting such a dual behavior. There are a few other suffixes characterized by dual behavior depending on the base they attach to (Schwarzwald 2002; they are referred to as variable suffixes in Graf 2000), presented in Table 3.

However, not all suffixes exhibit such dual behavior. Some suffixes are consistently stress-attracting ('accented suffixes' in Bat-El 1993), even when affixed to non-canonical bases (Graf 2000, Schwarzwald 2002), as is shown in Table 4.

Of special interest is the construct state masculine plural *-ei*. Though morphologically related to the plural suffix *-im* (Berman 1978:75), it does not exhibit the dual behavior of *-im*. Rather, it consistently attracts stress. Thus, in non-canonical words construct state plurals and free state plurals show different stress patterns:

- (1) a. *milyon* – *milyonim* ('million') *kurs* – *kursim* ('course')
- b. *milyonei* *ʔanafim* ('millions of people'), *kursei-mavo* ('introductory courses')

The above facts indicate that stress shift or the lack of it is not a property of bases or of suffixes by themselves. The same base may either retain its stress in suffixation or not, depending on the suffix (as in 1.a-b). Conversely, the same suffix may or may not attract stress, depending on the base (as illustrated in Table 2). Hence the occurrence or non-occurrence of stress shift is determined by the combination of a base and a suffix. Stress fails to shift to the suffix only when a variable suffix is attached to a non-canonical base. In all other combinations, stress shifts to the suffix.⁹

3. Core and non-core in MH lexicon

The notion of canonical bases, those bases which constitute the core of MH lexicon, plays an important role in the analysis to be presented below. Hence it is my goal in this section to give a more specific characterization of those classes which belong to the core domain of the lexicon. However, the lexicon of a language is not a stable, unchanging entity. The borders between core and non-core lexical domains are flexible and often fuzzy, influenced by diachronic changes resulting from coinage of new words, new word formation devices and constant contact with other languages. In Hebrew this fuzziness is all the more salient because of the recent changes, both in terms of lexical neologisms and in terms of morphological processes such as suffixation. Some classes of words exhibit non-unified behavior, patterning in some respects with the core lexicon and in others with the non-core lexicon. Other classes reflect generation differences among different speakers.

Intuitively, the core lexicon consists of the native vocabulary items, those not affected by any foreign influence. Ito and Mester (1995), characterizing the various subgroups of the Japanese lexicon, define the core as the domain subject to the maximal number of phonological constraints: in the center “The maximum set of lexical constraints hold in the core lexical domain....As the peripheral domain is approached, many of the constraints cease to hold (are “turned off”), or are weakened in various ways” (p. 820).

Schwarzwald (1998a) lists several phonological and morphological criteria that distinguish native Hebrew words from foreign words in the Hebrew lexicon. Of the phonological criteria, those most relevant for our purposes here are:

- i. Foreign consonants: [dʒ], [č], [ž] and [w] mark words with foreign origin.
- ii. Special consonant distribution: [p] and [b] tend not to occur in syllable final position. This is a residue of the Hebrew Spirantization Rule, which

changed the plosives [p t k b d g] into their fricative counterparts after a vowel. Though no longer active in MH, the rule left its traces on the distribution of certain stops in the language. Final [b] or [p] mark a word as foreign.

- iii. Stress: Default stress in Hebrew is final. (A special group of Hebrew words, known as Segolates, have penult stress. This group includes a small number of well defined prosodic patterns. For a treatment of the stress properties of this group, see e.g., Bolozky 1995, Falk 1996, Graf 1999).
- iv. Syllable structure: Most non-inflected Hebrew words are maximally tri-syllabic. Moreover, a tri-syllabic Hebrew word contains, in addition to the root consonants, a pattern (Mishkal) or an affixal segment(s). Thus, *mirp-eset* ('balcony'), *taklitan* ('D.J.'), *memsala* ('government') and *hafta'a* ('surprise'), all contain additional non-root consonants (marked in underlined letters here).

These criteria will help us identify the different lexical domains and the core-periphery relationship in the Hebrew lexicon.

Hebrew has three main means for word formation: the combination of a consonantal root with a specific vocalic pattern (called 'Mishkal') in a non-linear fashion, linear suffixation and compounding. The core lexicon of Hebrew consists, first and foremost, of words built on Hebrew Patterns (Mishkalim).¹⁰ These patterns are subject to the Final Stress constraint, as well as to the tri-syllabic max constraint. Core lexical items are also restricted to native consonants, and to the 'no p-b final' constraint. When variable suffixes are attached to this class of words, the suffix always attracts stress.

Suffixation, though less productive than root-and-pattern combinations, is also widely used, and it is becoming more widespread in current Hebrew. In addition to several original Hebrew derivational suffixes (e.g., *-on*, *-an*, *-ut*, *-iya*, *-ai*), MH has quite a few borrowed suffixes (*-nik*, *-čik*, *-er*, *-ist*, *-ism*, see Bolozky 1978 for a survey of these suffixes). Suffixes of both kinds may attach to both native and non-native bases. However, it is the suffix that determines the "nativeness" of the derived word: foreign suffixes render the entire word foreign. Hence words with foreign suffixes exhibit non-core behavior with respect to the variable suffixes, that is they do not allow stress to shift to the suffix. Native suffixes attached to native bases clearly form native words, exhibiting all the phonological properties of the core lexicon (that is, they are subject to all four constraints mentioned above). It is the class of words that is formed from a foreign base and a Hebrew suffix that displays non-unified behavior. Some words exhibit core behavior with respect to variable suffixes, other words ex-

Table 5. Stress pattern of suffixed forms of words consisting of a foreign base and a Hebrew derivational suffix

Uni-syllabic base		Di-syllabic base		Multi-syllabic base	
<i>bankai</i>	<i>banka-im</i>	<i>fizikai</i>	<i>fizika-im/</i>	<i>politikai</i>	<i>politika-im</i>
'banker'		'physicist'	<i>fizika-im</i>	'politician'	
<i>djunkia</i>	<i>djunki-yot</i>	<i>muzikai</i>	<i>muzika-im/</i>	<i>?estetikan</i>	<i>?estetikan-im</i>
'junkyard'		'musician'	<i>muzika-im</i>	'aesthete'	
<i>solan</i>	<i>solan-im</i>	<i>sitonai</i>	<i>sitonai-im</i>	<i>matematikai</i>	<i>matematika-im</i>
'solist'		'wholesale'		'mathematician'	
<i>sportai</i>	<i>sporta-im</i>	<i>grafikai</i>	<i>grafika-im</i>	<i>?akademai</i>	<i>?akadema-im</i>
'sportsman'		'graphic'		'academic'	
<i>pitiya</i>	<i>piti-yot</i>	artist'		<i>selebritai</i>	<i>selebrita?-im</i>
'Pitta eating place'		<i>historion</i>	<i>historion-im</i>	'celebrity'	
		'historian'		<i>arxiyonai</i>	<i>arxiyona?-im</i>
				'archivist'	

hibit peripheral behavior (Schwarzwald 1998a), and some words exhibit core behavior with respect to plural suffixes and non-core behavior with respect to the *-i* and *-iyut* suffixes. The generalization seems to be that words subject to the tri-syllabic max constraint exhibit core behavior, but there are too many exceptions to this generalization, as table (5) illustrates.

The other interesting class of words with respect to plural suffixation is that of compounds and blends. Noun compounds in Hebrew generally take the form of *smixut*, or construct state. This construction involves the adjacency of two nouns with no intervening element between them, and it expresses not only compounding, but rather "...manifests the full range of possible inter-nominal relations.... As well as the relation of possession" (Berman 1978:231). The construction is left-headed, and the head often, though not always, takes a special phonological form (the construct state form), which differs from the free form in its vocalic pattern. Pluralization of the *smixut* is done by attaching a special plural construct state suffix to the head (*-ei* for nouns taking the *-im* plural suffix, and *-ot* for nouns taking the *-ot* plural suffix). Since the head is the left-most element, the plural suffix intervenes between the head and the modifier. The modifier may be either singular or plural, depending on the specific compound, but its plurality does not affect the plurality of the compound as a whole.

- (2) a. *beit-sefer* (house-(of)-book, 'school') – *batei-sefer* (houses-(of)-book, 'schools')
- b. *gan yeladim* (garden-(of)-children, 'nursery school') – *ganei yeladim* (gardens-(of)-children, 'nursery schools')

Since the revival of Hebrew at the end of the 19 century, compounding and then blending have become more and more prevalent in the language. Some compounds and blends, especially those resulting in di-syllabic forms, began to be perceived as single words, which is also reflected in their written form (e.g., *ramkol* (*ram+kol*, ‘loud+voice’=‘loudspeaker’), *migdalor* (*migdal+ʔor*, ‘tower+light’= ‘light house’), *kolnoa* (*kol+noa*, ‘voice+move’=‘cinema’). These compounds are pluralized as single-based words, by attaching the plural suffix to the end of the compound as a whole (*ramkolim*, *migdalorim*, *kolnoʔim*). In recent years, more compounds and blends are perceived as single lexical items, even if they do not have the syllable structure and vocalic pattern of native words: *kaduregel* (*kadur+regel*, ‘ball+foot’=‘soccer’), *kadursal* (*kadur+sal*, ‘ball+basket’=‘basketball’), *maxazemer* (*maxaze+zemer*, ‘play+song’= ‘musical’). When asked to pluralize these forms, most speakers hesitate, and prefer breaking them into a double based form so as to pluralize them as a construct state construction (e.g., *kadurei-regel*). However, younger speakers sometimes pluralize them as a uni-based lexical item, using the unstressed plural suffix (e.g., *kadursalim* ‘basketballs’, *maxazemerim* ‘musicals’), as expected of words which do not conform to the syllable structure of core lexical items.

Another non-core domain quite prevalent in MH is acronym words. Acronyms exhibit core behavior in two respects: they are usually stressed on the final syllable (though in some cases they are stressed as segolates, on the penultimate; see Ornan 2003:98–102), and they do not contain foreign consonants. However, they do allow final [b] and [p] (*kalab* from *karov la-bayit*, ‘close to home’), and they have distinct syllable structure (e.g. *samankal* from *sgan menahel klali*, ‘vice general director’, which is tri-syllabic but contains no mishkal consonant). With respect to variable suffixes, acronyms exhibit a fixed stress behavior, that is they do not shift the stress to the suffix.

MH core lexicon, then, consists of nouns constructed by the root and pattern combination, and nouns formed by a Hebrew base+Hebrew derivational suffix. Other lexical domains, such as words consisting of a foreign base+Hebrew suffix, some compounds, blends and acronyms, adhere to some, but not all of the phonological constraints which hold in the core lexical domain. These classes of words exhibit varied behavior with respect to variable suffixes. Finally, borrowings and words with borrowed suffixes lie in the peripheral domains of the lexicon. They violate all the phonological constraints listed above, and they do not shift the stress to variable suffixes.

4. Semantic and distributional correlates of dual-behavior suffixation

Variable suffixes, then, exhibit two distinct phonological patterns: suffixation may result in stress shift, and then may further be accompanied by phonological changes to the base; or suffixation does not result in stress shift, and then no phonological changes are caused to the base. These two patterns correlate neatly with a cluster of properties. Stress-neutral suffixation is more regular and coherent than stress-shifting suffixation. (a) Semantics: Stress-shifting suffixation is less coherent semantically, in that the meaning of the suffixed form is not always compositional. Some plural forms have idiosyncratic meanings. For example, *ferutim* (*ferut-im*, 'services') has the additional meaning of 'WC'. Others are pluralia tantum (e.g., *panim* 'face', *raxamim* 'compassion', *xayim* 'life', *ʔatikot* 'antiquity', *ʔonot* 'miscellany', Schwarzwald 1991:593). And there are at least two nouns which are morphologically plural, but are syntactically singular: *behemot* 'behemoth/hippopotamus' and *beʔalim* 'possessor/owner'. These nouns are homophonous with the regular plural forms *behemot* ('beasts') and *beʔalim* ('husbands'), but their singular number is revealed by agreement.^{11,12} In contrast, stress-neutral plural suffixes are semantically coherent: the meaning of the complex forms is a compositional function of the meaning of its parts. (b) Morphology. Stress-shifting suffixes are sensitive to the internal morphological structure of the words to which they attach. They attach to forms constructed by the root and pattern combination, or to forms ending with a Hebrew suffix. Stress-neutral suffixes attach across the board to all nouns and adjectives, unless blocked by a lexically specified (that is, irregular) plural form. (c) Distribution: The distribution of stress-shifting suffixes is not entirely regular. There are nouns which do not take the plural suffix, for no apparent semantic or phonological reasons (see Schwarzwald 1991 for an extensive discussion of such nouns). Additionally, there are a few nouns which can take both suffixes, often with a subtle difference in meaning or syntactic conditioning: *ʔolam* 'world' – *ʔalamot* 'worlds', *ʔolamim* 'worlds' (often 'eternity'), and *yom* 'day' – *yemei* 'days of' – *yemot-* 'times of',¹³ *ʔana* 'year', *ʔanim* 'years' (free form), *ʔnot-* 'years of' (construct state form) (Schwarzwald 2002, 4:115–118). Stress-neutral suffixation, on the other hand, is fully productive. The stress-neutral suffixes can be affixed to any count noun, regardless of its phonological or morphological forms.¹⁴ Finally, while the choice of the plural suffix is not predictable when the suffix is stress-attracting, it is fully predictable when the suffix is stress-neutral: nouns ending with *-a* take the *-ot* suffix (*viola* – *violot* 'viola', *ʔameba* – *ʔamebot* 'ameba', *pica* – *picot* 'pizza'), all other nouns take the *-im* suffix (*avokado* – *avokadoim* 'avocados', *koncert* – *koncertim* 'concert',

kartiv – *kartivim* ‘popsicle’, *guru* – *guruim* ‘guru’).¹⁵ I am aware of one exception to this generalization: when a family name ends with *-a*, the plural (denoting the members of the family) is formed by the *-im* suffix rather than *-ot* (e.g., *ha-moria-im* ‘the Moria family’, **ha-moriyot*).

5. Default plural marker

A different aspect of plural formation in MH has been investigated by Berent, Pinker and Shimron (1999). They raise the question of whether MH has a default plural marker, that is, regular inflection that applies by the ‘elsewhere condition’ to any target that fails to trigger a more specific process (in the sense of Kiparsky 1973). Berent et al. hypothesize that although plural formation is irregular, native speakers use the *-im* suffix as the default plural marker for all masculine-sounding words outside the canonical root-and-pattern morphology, e.g., borrowings, acronyms and names. In a series of experiments, they presented native speakers with masculine sounding non-words that are highly dissimilar from existing Hebrew words, as well as masculine sounding words identical in form to existing Hebrew words, but used as borrowings or names (e.g., the word *kir* (‘wall’) was presented as a French drink or a family name). The subjects were asked to provide the plural forms for these words. Subjects invariably chose the *-im* suffix, although many of the homonymous Hebrew words are pluralized by *-ot*. Hence Berent et al. conclude that *-im* indeed functions as a general default plural marker in MH.

What has gone unnoticed so far is that the Berent et al. study is directly related to the dual behavior of plural suffixation described above, in that the class of words that takes the default plural marker is precisely the class that does not allow stress shift in plural formation. The experiments in the Berent et al. study were conducted in writing, hence the stress pattern of the target words was not documented (Hebrew orthography does not encode stress).¹⁶ However, had they done the experiment orally, it would have become clear that the default suffix does not attract stress. In other words, the plural marker, when functioning as a default marker, is stressless.

Additional support for the default nature of the stressless suffixation comes from acquisition data and from innovations of speakers forming plural for expressions lacking a plural form (such as phrases or titles). Levy (1983), in a longitudinal study of the acquisition of Hebrew plurals, identifies four stages in the acquisition processes. In the first stage, which marks the appearance of plural forms, the child used the *-im* suffix to mark plurality in all nouns. Crucially,

Table 6. First stage of plural acquisition

Singular	Correct plural	Child's form
<i>simla</i> (fem.) 'dress'	<i>smalot</i>	<i>simlaim</i>
<i>matate</i> (masc.) 'broom'	<i>metateʔim</i>	<i>matateim</i>
<i>ʔima</i> (fem.) 'mommy'	<i>ʔimahot</i>	<i>ʔimaim</i>
<i>ʔaba</i> (masc.) 'daddy'	<i>ʔavot</i>	<i>ʔabaim</i>
<i>kcica</i> (fem.) 'meatball'	<i>kcicot</i>	<i>kcicotim</i>

at that stage, stress does not shift to the suffix, and there are no phonological changes to the base, as is illustrated in Table 6 (Levy 1983, 111).

During the second stage, the feminine plural suffix *-ot* was introduced. The child applied it to all nouns ending with *-a* (irrespective of their gender). Levy points out that "at this point, there is still no attempt to move the stress nor any changes introduced to the internal vowels of the stem." (p. 112).

It is only in the third stage that the child becomes aware of some of the intricacies and irregularities of Hebrew plural formation, and only in the fourth stage (2;5–2;10) does s/he start shifting the stress to the suffix, and become attentive to internal vowel changes. However, because of the complexity and irregularity of the system, the child seems to be experimenting with the forms, which more often than not results in idiosyncratic forms. And throughout the processes, the default plural formation ("Add *-im* and do not change the base") is often called into use until the child has mastered the adult form. Studies of the acquisition of plural in other languages also find that the default form is overgeneralized to bases that take an irregular plural form (English — Pinker 2000, German — Clahsen et al. 1992, and Palestinian Arabic — Ravid & Farah 1999).

Finally, people use stressless plural suffixes productively, whenever they need a plural form for an expression with no specified plural form, such as a quotation or a phrase. For example, when referring to several issues of a journal named '*masa ʔaxer*' ("A different journey"), a speaker used the plural *masa-ʔaxer-im* ('Different Journey's'; the plural form of the NP when not used as a title is *masaʔ-ot ʔaxer-im*, where both head noun and modifier carry a plural suffix, and both suffixes attract stress). Another example is the compound *xatan-kala* (literally 'groom-bride', an expression used in a humorous way to refer to a bride and groom couple on their wedding day). When referring to an event attended by several bride-and-groom couples, a native speaker used the form *xatan-kala-im*.

Hence, experimental data, as well as data from acquisition and from actual language use, show that the plural suffix, when functioning as a default suffix, is stressless. This correlation calls for an explanation.

6. Analysis

One explanation is to assume that Hebrew has acquired a number of stressless suffixes. Hebrew has indeed borrowed a few stressless derivational suffixes, e.g., *-nik* (*kibucnik* – *kibucnikim* ‘a Kibutz member’), and the diminutive *-čik* (*katančik* ‘very small, minute’). These suffixes, though stressless, are not stress-neutral: they require the preceding syllable to be stressed. The suffixes analyzed in this paper, in contrast, are both stressless and stress-neutral. If we assume that these suffixes are borrowed as well, it would be difficult to explain why all these suffixes have homophonous stressed counterparts. It also fails to explain the semantic and distributional correlates of the two types of suffixation.

The suggestion I pursue here is that Hebrew has acquired a new way of combining a suffix with a nominal base, that is, that Hebrew acquired a new level for nominal suffixation. This approach accounts straightforwardly for the cluster of properties associated with each type of suffixation, and for the development of default forms as well.

As has long been observed (e.g., by Sapir 1925¹⁷), suffixes attach to bases in two different ways. These have been formalized in earlier theoretical frameworks in terms of two different boundaries: + and # (Chomsky and Halle 1968, Aronoff 1976), and were later rendered in terms of different levels of affixation in the Lexical Phonology and Morphology framework (LPM): stem level and word level respectively (Kiparsky 1973, 1982). Word level suffixes are structurally more loosely related to the stem than stem level affixes; stem level suffixes typically trigger and may undergo phonological changes and may cause stress shift in the base, while word level suffixes cause no idiosyncratic phonological changes to the base and are stress neutral. Morphological, syntactic and semantic correlates of stem vs. word level suffixes were pointed out (Aronoff 1976, Aronoff & Sridhar 1987). By and large, forms belonging to word level are more transparent: the base and the affixes are clearly identifiable, and there is one to one mapping between the phonological, morphological and semantic structures of the form. In stem level, the phonological structure is often non-isomorphic with the morphological structure (Aronoff & Sridhar 1987), and the semantics of the complex form may be non-compositional.

In the Optimality Theory (OT) framework (Prince & Smolensky 1993) the serial nature of LPM was abandoned in favor of a strict parallel constraint system. However, strict parallelism was challenged by Kiparsky (2000, 2002, to appear), who argues that a theory that maintains levels in the lexicon is more adequate and more explanatory than a strict parallel system. I follow the theoretical framework developed in Kiparsky (2000, 2002, to appear), Stratal OT. This framework combines the insights of both LPM and OT theoretical frameworks, in that it is a constraint-based version of LPM. It maintains the parallelism inherent in OT, together with the division of the lexicon into stem, word and postlexical levels of Lexical Phonology and Morphology. Each level is subject to a separate set of OT constraint systems, which are serially related. Morphological processes such as affixation may belong to different levels, associated with different rankings of phonological constraints.

The dual behavior of the Hebrew variable suffixes can be accounted for in terms of morphological levels: stress attracting suffixation belongs to stem level, while stress neutral suffixation occurs at word level. The different stress patterns (stress shift vs. lack of stress shift) are the result of different ranking of constraints at each level. Two kinds of constraints are at work here: a Faithfulness constraint, demanding maximal identity between the base and the affixed form (such as IDENT-IO), and general prosodic features of the language, requiring final stress (RIGHTMOST(ó)). At stem level, the site for the native lexicon, Final Stress is ranked higher than I-O Faithfulness. At word level, the site of more peripheral domains of the lexicon, where the word's similarity to its base is kept as close as possible (Graf & Ussishkin 2003:250), Faithfulness is ranked higher than Final Stress. This ranking is not accidental. Faithfulness to input is the hallmark of word level, in that the internal structure of word level forms is transparent, and the phonological and morphological structures correlate (as pointed out by Aronoff and Sridhar 1987). The specific ranking of the phonological constraints can therefore be regarded as a special case of the general characteristics of word level.

However, what is unique about the situation in Hebrew is that assignment to a particular level is not determined solely by the affixes, but by the bases as well. Not all bases can be assigned to both levels. Canonical bases, since they trigger particular suffixes, are restricted to stem level.¹⁸ All suffixation processes of canonical stems, both derivational and inflectional, take place in stem level. Hence suffixed words built on canonical bases always exhibit the default stress pattern of the language, final stress. Phonological changes to the base (such as changes in the vocalic pattern, spirantization and vowel deletion) are tolerated in these forms, since Faithfulness to input is not the highest ranked

constraint. The idiosyncratic properties of the suffixed forms in terms of choice of suffix (for plural or feminine formation), choice of allomorph and semantic interpretation have to be lexically specified. As such, they are characteristic of stem level morphology.

Non-canonical stems show different behavior: they are not restricted to stem level. The suffix attached to them determines whether suffixation takes place at stem level or at word level. Less productive suffixes are attached in stem level, while suffixation of the most productive suffixes belongs to word level. Thus, derivational suffixes such as *-an*, *-on*, *-iya*, which are less productive, as well as two less productive inflectional suffixes,¹⁹ are attached in stem level, resulting in the predicted final stress. The four most productive suffixes in the language (the plural, feminine, *-i* and *-iyut*) attach at word level, resulting in faithfulness to the base both in terms of stress and in terms of phonological shape. The distributional and semantic regularities of these suffixed forms follow naturally from their association with word level.

Table 7. Morphological levels and suffixation

	Canonical Stems	Non-Canonical Stems
Stem Level	All suffixation processes	Less productive suffixes
Final Stress >> Faithfulness	σ ó	σ ó
Word Level	✕	Productive suffixes
Faithfulness >> Final Stress		ó σ

Table 8. Two different types of suffixation in Modern Hebrew

stem level suffixation	word level suffixation
<ul style="list-style-type: none"> triggers phonological changes to the base: <i>tof-tupim</i> ('drum') shifts stress: <i>gir</i> – <i>girim</i> ('chalk') less coherent semantically: <i>ferutim</i> ('service+pl.=WC') less productive: do not apply to some words: <i>behemot</i> ('hippopotamus'). irregular distribution: choice of plural suffix cannot be determined by the form or gender of the singular. 	<ul style="list-style-type: none"> causes no phonological changes to the base: <i>avokado-avokadoim</i> stress neutral: <i>gir</i> – <i>girim</i> ('gear') semantically coherent fully productive: can attach to words of any phonological structure, even words ending with a vowel: <i>homo-homoim</i> ('homosexual') regular distribution: determined by the form of the singular: words ending with <i>-a</i> take the <i>-ot</i> suffix. All other words take the <i>-im</i> suffix.

In other words, the dual behavior of certain suffixes can be expressed in terms of different levels of suffixation: these suffixes behave as stem-level suffixes when attached to canonical bases, and as word-level suffixes when attached to non-canonical bases (Table 7).²⁰ The cluster of properties characterizing each type of suffixation follows straightforwardly from the assumption that they apply at different morphological levels, as summarized in Table 8.

This analysis has the following advantages: first, the default nature of the word level suffixes is accounted for. Word level affixes are much more regular and productive than stem level affixes, in that they apply across the board to an entire class of words. Stem level affixes attach only to morphologically or lexically specified classes of stems or words (Aronoff & Sridhar 1987:13). Hence only word level affixes can function as default marker in this case. Second, this explains the fact that all stressless suffixes have stressed counterparts: the suffixes themselves are not new, only the way they combine with the bases. In other words, the diachronic change in the language does not lie in the suffixes themselves, but rather in the way they attach to their bases, that is, in the activation of a new (additional) level for suffixation. Third, it accounts for the specific nature of the bases which take word-level suffixes. These words lie outside the canonical word-formation processes of the language, and hence fail to trigger any more specific affixational rules. This explanation also holds for canonical bases when used non-canonically (e.g., as proper names). Such forms are rootless, in the sense that they do not occupy a distinct entry in the mental lexicon. Since irregular forms are linked to roots and not to words (Pinker 2000:154), bases used non-canonically cannot be associated with irregular forms, and therefore they trigger only regular, default suffixation. Another advantage is that the semantic, morphological and distributional correlates of the dual phonological behavior of variable suffixes need not be separately stipulated. It falls out straightforwardly from morphological level analysis. Finally, within the framework of the suggested analysis, an explanation can be provided as to why it is this specific set of suffixes which lend themselves to word level affixation: these suffixes are the most productive and regular suffixes in the language: the plural and feminine inflectional suffixes, and the *-i* and *-iyut* derivational suffixes (see Table 3).²¹ All other suffixes are stem level. Stem level suffixes include all derivational suffixes, as well as two inflectional suffixes: the masculine plural construct state suffix *-ei*, and the set of possessive suffixes. These last two, though inflectional, are non-obligatory, since they have synthetic paraphrases, and in fact they have become quite rare in current language use (especially the possessive suffixes). The plural and feminine suffixes, in contrast, are obligatory. There is no other way to express these grammatical categories in the language

Table 9. Levels of suffixation in Hebrew

Stem Level: All nominal suffixation (inflectional and derivational)	Stem Level: Core Lexicon All nominal suffixation	Stem Level: Non-core lexicon Non-regular (mainly derivational) suffixes
Word Level: Non-core lexicon: Regular (default) suffixes: inflection (pl., fem.), derivation (-i, -iyut).		
Earlier stages of Hebrew	Recent Modern Hebrew	

other than by means of suffixation. And the *-i* and *-iyut* suffixes are by far the most productive derivational suffixes in the language, and speakers use them to create novel forms whenever the need arises.²² The necessity to use these suffixes with all bases, irrespective of their morphological and phonological properties, resulted in the activation of a new morphological level, where suffixes are not readily fused (phonologically, morphologically and semantically) with their bases, word level.

These diachronic changes are quite recent. In earlier stages of the language, plural suffixes were always stress-attracting, even when attached to borrowed words, e.g.: *teʔatron-teʔatraʔot* ('theatre', of Greek origin), *maʃkanta-maʃkantaʔot* ('mortgage', of Aramaic origin), *ʔadrixal-ʔadrixalim* ('architect', of Akkadian origin, via Aramaic), and even the more recent *ʔuniversita-ʔuniversitaʔot* ('university').²³ In the model presented here, such forms are lexically marked, hence they belong to stem level. Table 9 summarizes the changes the nominal suffixation system of Hebrew underwent.

The model suggested above makes the following predictions:

- a. If a base takes a word-level suffix it is a non-canonical base.
- b. If a dual-behavior suffix exhibits stem-level behavior, then the base it attaches to is a canonical word.

To the best of my knowledge, there are few if any counterexamples to the first prediction. Only non-canonical bases take word-level suffixes.²⁴ As for the second prediction, there are two types of possible counterexamples. First, old borrowings take only stem level suffixes. As pointed out above, word-level suffixation is a new phenomenon in the language. Old borrowings, while differing from native bases in their syllable structure, nonetheless pattern with native bases in their behavior under plural suffixation. Thus the stress pattern of the plural form of a foreign word is an indicator of the point at which it entered the

language: if a foreign word exhibits only stem level suffixation, it entered the language at an earlier stage.²⁵

The second type of counterexamples consists of non-canonical words which share the vocalic pattern of canonical words. Typically, these are disyllabic stress-final words, with 3–5 consonants. Thus, *mankal* ('C.E.O.' acronym), *salat* ('salad', borrowing), *fmartaf* ('babysitter', blend) are perceived by speakers as being canonical (on a par with the canonical *mal'ax* 'angel', *tabax* 'cook' and *klavlav* 'a little dog/puppy'), and consequently are restricted by some speakers to stem-level suffixation.²⁶ These two types of counterexamples indicate that the diachronic change Hebrew is undergoing is still very dynamic, being shaped by forces such as the relative youth of a word in the language, and the resemblance of newly formed or borrowed words to canonical forms.

7. Against a phonological analysis

Several studies offer a phonological account of the stress behavior of suffixed forms in MH, without resorting to morphological levels. In principle, such analyses are more economical than the one suggested here, because they do not involve extra morphological apparatus. However, as I show below, a purely phonological analysis cannot account for all the data, and is less explanatory than an analysis in terms of morphological levels.

Bat-El (1993) and Graf (2000) suggest an analysis of stress assignment in both derived and non-derived forms. They both assume that default stress in Hebrew is on the final syllable, yet some morphemes (both stems and affixes) are marked for stress in the lexicon (Bat-El's 'accented formatives'). Lexically marked stress takes precedence over default stress, hence accented stems do not allow the stress to shift to the affixes. Thus, in *traktor-traktorim* ('tractor'), stress does not shift to the plural suffix since the base is lexically accented. In order to account for the stress shift in some suffixes (such as *-an*, as in *traktorán* 'tractor driver'), Bat-El further distinguishes between cyclic and non-cyclic affixes. Cyclic suffixes always precede non-cyclic suffixes, and they trigger the Stress Erasure Convention; that is, cyclic suffixes remove any metrical structure previously assigned. Suffixes such as *-an* are cyclic, hence they remove the lexically assigned accent of the base. In contrast, the non-cyclic plural suffixes respect previously assigned metrical structure.

Graf presents a similar analysis within an OT framework, where stress assignment in suffixed forms is the result of an interaction between two constraints: the demand that faithfulness to lexically specified prosodic rules be

preserved (MAX-HD-FT), and the demand that each word should be assigned final stress (ALIGN-HEAD). The specific ranking of the former over the latter ensures that lexical stress is always preserved, and takes precedence over the phonologically assigned (default) stress.

These analyses are similar to the one suggested here in assuming different classes of bases (formatives) and different classes of suffixes. Stress assignment is the result of attaching a specific type of suffix to a specific base. However, there are a few classes of bases that present a problem to such an approach. There are classes of nominals which are not lexically marked for stress, yet they do not allow stress shift to the suffix. This is the case with acronyms (as pointed out by Graf & Ussishkin 2003), blends and compounds. Acronyms seem to obey the prosodic constraints of the core lexicon of the language (Bat-El 1994), hence are usually stressed on the final syllable. Blends and compounds usually inherit their stress from the rightmost member of the complex form (e.g., *maxazemer* ('musical') – *maxaze* ('play') + *zemer* ('song'), *kadursal* ('basketball') – *kadur* ('ball') + *sal* ('basket')). Yet when pluralized as a single lexical item (rather than as a smixut construction, see Section 3 above), stress does not shift to the plural suffix (see Table 1). Graf & Ussishkin suggest that "Acronym words belong to the peripheral domain of the lexicon, where the word's similarity to the base is kept as close as possible" (p. 250), and allow for different ranking of constraints in specific classes of words. Such an approach, which incorporates morphological class membership into the phonological analysis, is close to the one suggested here, but it involves additional apparatus.

Becker's analysis (2003) draws a correlation between stress assignment and the syllable structure of the word. He suggests that all the items that have no underlying stress (which he refers to as 'words with mobile stress') are subject to a disyllabic maximum constraint. That is, stress shift to the suffix is restricted to words whose roots are maximally disyllabic.²⁷ Thus, *psanter* ('piano') has mobile stress (*psanterim*), since it is disyllabic, while *diktator* ('dictator') has fixed stress (*diktatorim*) since it is tri-syllabic.

This analysis faces some empirical problems, in that there are a few tri-syllabic words with mobile stress in Hebrew, such as *livyatan* – *livyatanim* ('whale'), *pilegef* – *pilagfim* ('concubine'), *ʔakavif* – *ʔakavifim* ('spider'), *ciporen* – *cipornim* ('carnations'), *miktoren* – *miktornim* ('jacket'), *taklitor* – *taklitorim* ('CD'), *kaduraglan* – *kaduraglanim* ('soccer player'), and the newly coined *selebritaim* ('celebrities'). In addition, the old loans mentioned above exhibit mobile stress, whether or not their root is maximally disyllabic.

The main problem, however, for a strict phonological analysis, is its failure to account for the specific nature of the class of words with fixed stress (Bat-El's

'accented formatives'). Under Bat-El's and Graf's analyses, whether a word has fixed or mobile stress is an idiosyncratic property of each word. In Becker's analysis, this falls out from its syllabic structure. Indeed many foreign words and acronyms have stems consisting of more than two syllables, but there are also numerous monosyllabic or disyllabic borrowings in the language. Whether a mono/disyllabic word has fixed or mobile stress must be stipulated in Becker's model.

The behavior of nouns used as names is also incompatible with a strict phonological account, as pointed out by Berent et al. (1999:32). Names having phonological forms identical to existing canonical nouns nonetheless have different plural forms (e.g., *barak* – *brakim* ('lightning') vs. *barakim* ('The Barak family')). This difference cannot be explained without referring to the morphological make-up of these forms, specifically to 'rootlessness' of names.

In addition to the difficulties of explaining in a non-stipulative manner the language internal facts, such an approach also fails to capture important cross-linguistic similarities. The list of classes of words taking the word-level default plural marker in MH is very similar to the classes that take default markers cross-linguistically. Typically, these included any word that is perceived as 'foreign' or any item that is not listed as a word. Foreign elements are those that do not adhere to some phonological constraints holding of native lexical items, and newly coined words formed by processes such as compounding, blending and acronyms. Nouns and phrases used as names, as well as titles are not listed in the mental lexicon, hence trigger default rather than irregular inflectional markers. Pinker (2000) surveys several morphologically different, unrelated languages (e.g., English, German, Dutch, French, Hungarian, Arapesh and Chinese), showing that the default marker is called into service in very similar situations cross-linguistically. This fact cannot be captured without reference to morphological classes, since the specific phonological properties characterizing core vs. non-core lexical items vary from language to language.

Finally, a phonological analysis cannot account for the semantic and distributional correlates of the two types of suffixation. Such an approach cannot account for the fact that stress shift to the suffix is associated with irregular distribution of affixes (*-im* vs. *-ot*) and less coherent semantic interpretation, while lack of stress shift to the suffix is associated with regular distribution, predictable association of gender assignment, and semantic coherence. These arguments strengthen the conclusion reached by Berent et al., namely that an analysis which views suffixation as a morphological process is more explanatory and adequate than a strict phonological analysis.

8. Cophonology and comorphology

Ito & Mester (1995), in their model of the Japanese lexicon, show that different domains of the lexicon (morpheme classes) are subject to different sets of phonological constraints. Each such domain within the phonology of a language is called ‘cophonology’ (see e.g., Inkelas 1999, Inkelas et al. 2004), defined as “a phonological grammar, i.e. an input-output mapping, which coexists with other phonological grammars in the language” (Inkelas et al. 2004:2). Cophonologies can be associated with morphological levels, as, for example, in Turkish stress assignment. Inkelas (1999) shows that Turkish has two productive stress patterns, defined by different ranking of constraints: stem-level cophonology assigns a pattern of non-final stress (called “Sezer stress” after its discoverer, Engin Sezer), while word-level cophonology assigns default final stress.

According to the above definition of cophonology, stem-level and word-level suffixation of Modern Hebrew define two cophonologies in the language. The two sub-systems are productive: newly coined forms consisting of a foreign base and a Hebrew (less productive) suffix exhibit stem level behavior, while native nouns used as names exhibit word level behavior under suffixation. The two cophonologies differ in the ranking of the constraints, along the lines suggested in Section 6 above.

However, the two levels define not only two phonological subsystems, but also two morphological subsystems. The diachronic change that resulted in the activation of word level for suffixation caused a substantial change in the morphology of MH: it led to the evolution of two different morphological systems coexisting in one language, which I call ‘comorphologies’. These two systems differ with respect to gender assignment and inflectional classes. These differences are summarized in Table 10.

In describing the two comorphologies, I follow Aronoff’s (1994) model of gender and inflectional classes. Inflectional class, according to Aronoff, is the set of lexemes whose members each select the same set of inflectional realizations. As such, it is a purely morphological notion. Gender, on the other hand, is a syntactic category, which manifests itself only via agreement with nouns.²⁸ A language has gender only if that language has agreement with nouns, which involves a distinction among noun classes (p. 66). Usually there is partial correlation between gender and inflectional classes, in that “Inflectional classes are almost always partially determined by gender” (p. 63). However, the mapping is not perfect, thus supporting the distinction between the two notions.

Aronoff presents an analysis of Hebrew gender and inflectional classes. According to the view presented in this paper, Aronoff’s analysis actually applies

Table 10. Properties of stem-level and word-level comorphologies

Stem-level comorphology	Word-level comorphology
<ul style="list-style-type: none"> • Gender is a lexical property of each noun. • There is partial overlap between gender and form. However, the mapping is incomplete. • The choice of the plural suffix may be lexically determined. • The choice of the allomorph of each suffix (<i>-im/-ayim, -ot/-iyot/-a?ot</i>) is lexically specified. • The choice of feminine marker is lexically determined (<i>-a/-it/-et/-ut</i>). • The choice of the feminine suffix (used to derive feminine nouns from masculine nouns, <i>-a/-et/it</i>) is determined by a complex set of rules.^a 	<ul style="list-style-type: none"> • Gender is determined by the phonological shape of the noun. • The mapping between gender and phonological form is complete. • The choice of the plural suffix is phonologically determined. • There is no allomorphy. • The feminine marker is <i>-a</i>. • The feminine suffix is <i>-it</i>.^b

^a See Schwarzwald (2002, 4:38–72) for an extensive discussion of the various factors determining the choice of the feminine suffix.

^b Word-level comorphology necessitates drawing a distinction between the feminine marker and the feminine suffix. The feminine marker is the last segment of a non-derived feminine nominal, while the feminine suffix is the suffix used to derive feminine nominals from masculine ones.

only to stem-level suffixation. The word-level subgrammar works very differently, as I show below.²⁹

Stem-level comorphology: Hebrew, according to Aronoff, is a language with gender but no inflectional class. Gender is reliably revealed by agreement of adjectives, numerals, verbs and participials with the noun. There is also partial correlation between gender and the morphological form of a noun, and between the form of the singular and the choice of the plural suffix, expressed by the following generalizations (ibid., p.78):

- i. The largest number of masculine nominals show no suffix in the singular and the suffix *-im* in the plural.
- ii. The largest number of feminine nominals show the suffix *-a* in the singular and the suffix *-ot* in the plural.

However, these two patterns cannot be regarded as inflectional classes, because there are no nominal paradigms in the language. The choice of the plural suffix is not reliably determined by the form of the singular noun, nor from its gender. And the form of the singular is also only partially determined by gender. Thus, the distribution of suffixes in the language can be rendered in terms of a complex set of realization pairs, where the realization of more specific rules takes precedence over less specific ones (ibid., p. 79). The lack of full correlation

between gender and morphological realization, the lack of noun paradigms and the numerous allomorphs for each suffix make this system complex and unpredictable.

Word-level comorphology: The morphology of gender and inflectional classes at the word level is remarkably different. It is completely regular, there are two inflectional classes in the system, and the mapping between gender and inflectional class is almost perfect. Moreover, both gender and inflectional class are reliably determined by the phonological form of the noun. It is this latter characteristic that makes this system special. A noun class system that is phonologically determined is quite rare among the languages of the world. Such systems exist in several language families of Papua New Guinea. Two of these languages, Arapesh (of the Torricelli family, spoken near the north coast of Papua New Guinea), and Yimas (a member of the Lower Sepik family) are discussed at length in Aronoff 1994. The noun class systems of these languages are much more complex than that of Hebrew, at least from the point of view of the number of classes in each language: Arapesh, for example, has 13 genders and about 22 inflectional classes. However, what is relevant to our point here is that gender assignment and membership in an inflectional class is largely determined by the phonological shape (in particular, the last phonological segment) of the noun. Hebrew word level morphology also works in such a way: the gender of the noun is determined by its phonological form. Nouns ending with *-a* are feminine; all other nouns are masculine. The inflectional class of a noun is also phonologically determined: nouns ending with *-a* take the *-ot* suffix. All other nouns take the *-im* suffix; e.g. *viola* is feminine, but *čelo* is masculine; plural *violot* and *čeloim*. These generalizations can be stated in terms of the following implicational rules (3a–d) and realization pairs (3e–f):

- (3) a. $N, Xa \rightarrow \text{class I}$
 b. $N \rightarrow \text{class II}$
 c. $\text{Class I} \rightarrow \text{gender fem.}$
 d. $\text{Class II} \rightarrow \text{gender masc.}$
 e. $\langle [N, \text{class I, Plural}], (X \rightarrow Xot) \rangle$
 f. $\langle [N, \text{class II, Plural}], (X \rightarrow Xim) \rangle$

The only exceptions to (3.a) are words referring to human males, such as *kolega* ('colleague'),³⁰ *maharadja* ('Maharajah'), *baba* ('Holy person' in the North African Jewish tradition). These are assigned masculine gender, as revealed by agreement: *kolega xafuv* ('an important (masc. singular) colleague'), *baba mefursam* (a famous (masc. singular) Baba').³¹ However, they still belong to Class I, and consequently take the *-ot* plural suffix: *kolegot*, *babot*. This is the

Table 11. Stem-level and word-level sub-grammars

	Membership	Phonology	Morphology
Co-grammar A (stem level)	Core lexicon	Final stress >> Faithfulness	<ul style="list-style-type: none"> • Lexically assigned gender • No inflectional classes • Allomorphic variations
Co-Grammar B (word level)	Non-core lexicon	Faithfulness >> Final stress	<ul style="list-style-type: none"> • Phonologically determined gender • Two inflectional classes • No allomorphic variation

only lack of full mapping between gender and inflectional class in the system, lending further support to Aronoff's distinction between the two.

The feminine derivational suffix of this subgrammar is *-it* (as opposed to stem level morphology, in which the feminine derivational suffix consists of a few allomorphs, see Schwarzwald 1998a:134). This can be represented by the following rule:

- (3) <[N, class II, feminine], (X → Xit)>

Word level morphology, then, consists of two genders, two inflectional classes, and a set of 4 implicational rules relating gender and inflectional class membership to the phonological form of the noun. Stem level morphology, on the other hand, consists of two genders, no inflectional class, and a very complex set of realization pairs, which tries to capture patterns of correlation, with varying degrees of specificity. Thus, the activation of word level suffixation resulted in the emergence of two subgrammars, differing from each other both phonologically and morphologically. This is summarized in Table 11.

Interestingly, the gender category per se has not changed. Hebrew today, as in earlier stages, has a gender system that consists of two genders, masculine and feminine, which are reliably revealed by the syntactic mechanism of agreement. Whether gender is associated with inflectional classes (as in word-level comorphology) or not (in stem-level comorphology), the syntactic effects are the same: masculine nouns trigger masculine suffixes on adjectives, participles and verbs, while feminine nouns trigger feminine suffixes. This lends further support to Aronoff's claim that gender is a syntactic, and not a morphological, category. It is the morphological structure of Hebrew that has changed (its inflectional class system), not its syntax.³²

9. Conclusions

The dual behavior of certain suffixes in Modern Hebrew with respect to stress-assignment has been accounted for in terms of a new morphological level for nominal suffixation in the language. This level is the site for concatenation of regular suffixes to non-canonical bases. Irregular suffixation and suffixation of canonical nouns take place at the stem-level, which was the only level available for nominal suffixation in earlier stages of the language. This morphological change brought about two additional modifications to the system: the development of true default markers and the emergence of two distinct comorphologies in the language.

Aronoff & Sridhar (1987:19) point out that English is considered odd in having two levels of affixation, and that this oddity is often attributed to the mixed ancestry of the language — “bastard child of Germanic out of Romance”. Kannada (also discussed in Aronoff & Sridhar), a Dravidian language heavily Sanskritized, is another example of such a language. And foreign vocabulary in Turkish is subject to different mechanism of stress assignment, thus resulting in two stress patterns which are assigned on two different levels (Inkelas 1999). While modern Hebrew has retained much of the morphological system of Biblical Hebrew, in particular the root-and-pattern non-concatenative morphology, it might be that the flux of foreign borrowings and foreign word formation processes (such as prefixation and blends) has led to a similar change in its morphological structure.³³ If levels of affixation contribute to the morphological typology of languages, then it seems that MH is undergoing a change in its typological characterization, by adding word-level to its stem-level nominal suffixation.

Notes

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** Bold letters in the examples indicate a stressed syllable.

1. Historically, *-ayim* is the dual suffix. However, in MH it functions as a dual suffix only when attached to few nouns denoting time periods (*jaʔa* (‘an hour’) – *jaʔatayim* (‘two hours’), *yom* (‘day’) – *yomayim* (‘two days’), and similarly *javua* (‘week’), *xodef* (‘month’)

and *fana* ('year'). Otherwise, it usually attaches to words denoting paired body organs, but it denotes plurality rather than duality: *raglayim* ('leg'+-*ayim*) means 'legs', not 'two legs'. (This holds for Biblical Hebrew as well, e.g., *fej knafayim* ('six wings') (Yarkoni 2004, 59). It also appears in a few pluralia tantum, e.g., *famayim* 'sky', *mayim* 'water', *cohorayim* 'noon', and in nouns denoting objects composed of two parts, such as *miškafayim* 'glasses', *ʔofanayim* 'bicycle' and *mixnasayin* 'trousers'.

2. When the feminine plural suffix *-ot* attaches to words ending with *-a*, it replaces the vowel in word final position: *ʔagala* – *ʔagalot* ('wagon')

3. In Schwarzwald's (1991:595) dictionary count, she found that out of 3926 nouns with a feminine ending, 69 took the *-im* suffix.

4. The gender of Hebrew nouns is reliably revealed only by agreement. Agreeing adjectives, verbs and participles agree in gender with the noun. Thus, an adjective modifying a feminine noun is morphologically marked as feminine, whether or not the noun is phonologically marked as feminine (e.g., *ʔeven levan-a* 'a white (fem.) stone (fem.)'). Similarly, the choice of the plural suffix in adjectives is entirely predictable from the gender of the head noun: adjectives modifying masculine plural nouns take the *-im* suffix, and adjectives accompanying feminine plural nouns take the *-ot* suffix. The predictability of plural marking in adjectives led Schwarzwald (1991) to suggest that adjectival pluralization takes place in the grammar, while nominal pluralization takes place in the lexicon.

5. Falk 1996 presents an account of vowel reduction in suffixed forms in Hebrew.

6. Even in adjectives, the phonological changes to the base caused by suffixation are not fully predictable, as in the following examples: *gadol* – *gdolim* 'big' vs. *varod* – *vrudim* 'pink'; *falit* – *falitim* 'reigning' vs. *favir* – *fvirim* 'fragile'.

7. Schwarzwald 1998b uses the term 'non-integrated words' for words which lie outside of the core MH lexicon.

8. The only possible phonological change to the base is stress shift. When a stressless plural suffix attaches to a base with stress antepenult, stress often shifts to the penult in the suffixed form, as in *ʔotobus* – *ʔotobusim* ('bus'), *telefon* – *telefonim* ('telephone'). This stress shift occurs in some forms but not in others, and varies among speakers (Bat-El 1993). It can also be attested in some adjectives derived from penult bases (*london* – *londoni* 'a Londoner').

9. Excluded from this description are a few prestressing suffixes, such as *-nik* and *-čik* (borrowed from Russian), which require that main stress fall on the penultimate in the singular, and on the antepenultimate in the plural.

10. For an in-depth description of this mechanism, see Ornan 2003.

11. The following example illustrates that *beʔalim* is indeed singular:

- (i) *ha-beʔalim fel ha-kelev axrai lanezakim je-ha-kelev gorem.*
 the-owner of the-dog responsible (sg.) to.the.damages that-the-dog inflict
 'The owner of the dog is responsible for all damages caused by the dog.'

12. *ʔelohim* ('God' and 'gods') is also plural in form yet syntactically singular, when used to refer to God (Schwarzwald 2002, 4, 97). I thank Ora Schwarzwald for this point.

13. *yemei* and *yemot* are the plural construct state forms of *yom* ('day').

14. Schwarzwald's list of nouns which do not pluralize (2002, 4:137–138) includes some non-core nouns as well, including professional areas of studies such as *filologya* 'philology', *geometriya* 'geometry', *ʔakustika* 'akustics'. I disagree with her judgments here. Such nouns can be pluralized in appropriate contexts.

15. As was pointed out to me by Edit Doron, the plural form of nouns ending with *-i* is *-im* rather than the expected *-iim* (e.g. *sini-sinim* 'Chinese persons'). In adjectives, however, plural forms often retain both vowels: *siniim* 'Chinese (adj)'. See also Schwarzwald 2002, 4:148.

16. Berent et al. do mention that default suffixation is stressless. However, their experiments were designed to examine the choice of the plural marker (*-im* or *-ot*), and did not take stress into consideration.

17. Sapir (1925, fn. 6) attributes to L. Bloomfield the observation that "the agentive *-er* contrasts with the comparative *-er*, which allows the adjective to keep its radical form in *-ɲg-* (e.g., *long* with *-ɲ*: *longer* with *-ɲg-*)." Consequently, Sapir analyzes the agentive *-er* as an affix that attaches to a word, while the comparative *-er* is affixed to stems. I thank Mark Aronoff for bringing this reference to my attention.

18. It should be emphasized that the discussion in this paper is restricted to nominals. It might be that verbal suffixation takes place at word level (as pointed out to me by Yehuda Falk). However, this issue lies outside the scope of this paper.

19. For a discussion of the notion of productivity in morphological processes, see Aronoff 1976, 1980.

20. Hebrew is not unique in having homonymous word vs. stem level suffixes. Aronoff (1976) and Aronoff & Sridhar (1987) discuss such suffixes in English and Kannada, showing that the morphological differences are accompanied by the expected semantic and distributional differences.

21. These suffixes are productive even at stem level.

22. Recent attested examples for such innovations are *divaiyut* (Diva-ness), *ha-sax-hakoliyut* ('the all-in-all-ness'), *homoiyut* ('homosexual-ness'), *klumiyut* ('nothingness').

23. Schwarzwald (1998a) mentions that there are a few exceptions to this generalization, e.g., *kategor* 'prosecutor' and *sanegor* 'defender', which were borrowed into Mishnaic Hebrew, yet their plural forms do not display stress shift.

24. Schwarzwald (1998a, 139–140) points out that in very rare cases, native words are perceived as foreign and display a foreign stress behavior under suffixation. For example, the adjective *tupi* ('drum-like shape'), is perceived as foreign when modifying the noun *ʔekdax* ('revolver'), probably because other adjectives modifying this noun are foreign, and because its meaning in this NP is not transparent.

25. When, precisely, the change took place is unclear. However, I think it is reasonable to assume that this diachronic change is closely related to the revival of Hebrew as a spoken language, at the end of the 19th century and the first decades of the 20th century.
26. Blends ending with *-or* seem to constitute another type of counterexamples. For most speakers, they are pluralized at stem level, though they do not have a canonical vocalic pattern: *migdalar* – *migdalarim* ('lighthouse'), *taklitor*–*taklitorim* ('CD'). It might be that *-or*, a clipped form of the noun *ʔor* ('light'), has been reanalyzed by speakers as a Hebrew suffix, hence triggering 'canonical' morphology.
27. Becker does not define what he means by 'root'. However, from his analysis, it seems that he refers to the word minus any affixal material, or phonological segments that are part of the Mishkal (i.e., pattern). Thus, *haclaxa* ('success'), though trisyllabic, has a monosyllabic root, since the initial *ha-* and the final *-a* are part of the Mishkal.
28. For a comprehensive description of gender and noun class systems in the languages of the world, and mechanisms of gender assignment, see Corbett 1991.
29. Aronoff points out that "It is usual to distinguish the stage of Hebrew that one is talking about: Biblical, Masoretic, Mishnaic, rabbinic or modern. But when it comes to gender and number in nouns and adjectives....there is no systematic difference among the various stages." (p. 183). The analysis presented in this paper shows that at least Modern Hebrew has to be distinguished, in that it developed two distinct inflectional class systems.
30. The noun *kolega* ('colleague') is actually both masculine and feminine.
31. The fact that semantic factors take precedence over other factors in determining the gender of [+human] referents is common cross-linguistically (Corbett 1991:74).
32. As was pointed out by an anonymous reviewer, the agreement system of MH is also undergoing some changes, in that in certain syntactic environments gender agreement is lost, e.g., in VS constructions (Berman 1992) and in numeral-noun constructions (Ravid 1995, Meir 2005). However, these changes are insensitive to the characteristics of the head Noun (that is, whether it is a canonical or non-canonical lexical item); they apply to all lexical items occurring in these specific syntactic environments. Hence these changes lend further support to the distinction between gender and inflectional classes.
33. Continuous contact with non-Semitic languages and intensive borrowing have had typological effects on the morphology of other Semitic languages. For example, Hoberman and Aronoff (2003) argue that productive derivation in the verb system of Maltese is done by affixation rather than by the Semitic root-and-pattern morphology.

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