Vowel Deletion and Nonprimary Stress in Modern Hebrew

Nirit Kadmon

Recommended Citation

Kadmon, Nirit (1986) "Vowel Deletion and Nonprimary Stress in Modern Hebrew," *University of Massachusetts Occasional Papers in Linguistics*: Vol. 12 , Article 2.
Available at: https://scholarworks.umass.edu/umop/vol12/iss2/2

VOWEL DELETION AND NONPRIMARY STRESS IN MODERN HEBREW*

Nirit Kadmon

0. Introduction

There is a rule of Modern Hebrew sentence phonology, which optionally deletes the vowel [e]. (To the best of my knowledge, this rule was first discussed in Bolozky (1977).) For example, alongside the form aní meviná otó ('I understand (fem) him'), there is a form aní mviná otó, where the e has been deleted. One of the constraints on e Deletion is that it cannot create a stress clash. For example, the string atá mevín otí ('You understand (masc) me') does not have a corresponding e-less form *atá mvín otí, with stresses on two adjacent syllables. Sometimes, a stress change makes it possible for e Deletion to apply and yield a grammatical string. For example, we do have the form áta mvín otí, where the stress on ata (isolation form: atá) has been shifted, and e Deletion has applied without creating a stress clash.

Stress changes in Hebrew affect only stresses which are very low in prominence. I will propose that there is a single rule which assigns all the secondary (that is, non-primary) stresses

1

in Hebrew, and that this rule plays a crucial role in creating the stress changes. I will then present an analysis of the intercation between stress changes and e Deletion.

My analysis will be couched in the general framework of Selkirk (1983) (Phonology and Syntax: The Relation Between Sound and Structure).   Some basics of the theory which she assumes and develops are outlined in section 1.

1. Preliminaries: The Metrical Grid

        Liberman (1975) has proposed the metrical grid as a representation of the rhythmic organization of natural language, which is analogous to the description of musical rhythm. It works as follows.

        Imagine a sequence of even pulses. It can be represented as x x x x x x x x. Now impose a 2/4 time on this sequence. In the resulting rhythm, there are pairs of beats, in which the first beat is stronger than the second one. This can be represented as
x   x   x   x
x x x x x x x x. Similarly, a Waltz rhythm can be represented as
x   x   x
x x x x x x x x. With a 4/4 time, our pulses would be divided into sequences of four beats, in which the first beat is the strongest, the second and fourth beats are the weakest, and the third beat is of intermediate strength. This can be represented
                x   x
                x   x   x   x
as follows: x x x x x x x x. In short, higher rhythmic prominence is represented by a higher column of x's. This kind of representation is called a 'metrical grid', and the horizontal lines of x's (or 'grid entries') are called 'levels'. Stress patterns of language can be represented in the same way. For example, the stress pattern
                        x
                    x   x
                    x   x x
of represént can be represented as represent. The first grid level contains entries for three pulses, corresponding to the three syllables, the second level contains entries for the stressed syllables only, and the third level contains a single entry, aligned with the strongest syllable, the one that carries the main word stress.

        For Liberman (1975) and also Liberman and Prince (1976) and later work in the 'metrical' tradition, the basic patterns of stress in language are represented by metrical trees, a phonological representation independent of the metrical grid, and the grid is used for representing further rhythmic organization.

        Prince (1983) has proposed that the metrical grid be promoted to the status of the sole representation of stress patterns, and that the theory of possible stress patterns be cast in terms of the way syllables are aligned with grid entries. Selkirk (1983)

adopts this position and provides more arguments for it and
further development of the theory of syllable-to-grid alignment.

Selkirk proposes a system where the grid is constructed on
the basis of syntactic surface structures, augmented with
information about syllabification and about intonation
(intonational phrasing and pitch accents). The grid is built
from the bottom up, level by level. Grid construction rules
operate cyclically. The cyclic domains are syntactic
constituents, and the largest cyclic domain is the Intonational
Phrase (which counts as an "honorary" syntactic constituent).

In what follows, I will sometimes make reference to specific
details of Selkirk's theory, but I think that the main points of
my analysis are independent of these details.

2. Beat Addition

The main stress in Hebrew words is most commonly final, and
sometimes penultimate. To its left, there is an alternation of
unstressed and secondarily stressed syllables. The alternation
is often very 'neat', as in the forms on the left in (1) below,
but not always. Forms with sequences of two and even three
unstressed syllables, like the variants on the right, are
perfectly natural as well.[1,2] Within the intonational Phrase, a
syllable carrying a secondary stress is never adjacent to any
other stressed syllable. (For some illustration, see (13) and
(14) in 3.1 below.)

(1) a- mešuga   amešuga
     the-crazy

     maasiyot   maasiyot
     tales

     a- mevugeret   amevugeret
     the-adult

     ve- me- a- mikteret   vemeamikteret
     and-from-the-pipe

     ve- kše- me- a- mikteret   vekšemeamikteret   vekšemeamikteret
     and-when-from-the-pipe

     mevoot yerušalaim   mevoot yerušalaim
     the entrance to Jerusalem

To account for the basic patterns of word stress, I propose
the rules in (2) and (3).

(2) Text to Grid Alignment rules:

<u>Demibeat</u> <u>Alignment</u>: Align each syllable with a single demibeat. (A demibeat is a grid entry on the first metrical level.)

<u>Main</u> <u>Stress</u> <u>Rule</u>: Align the last demibeat in a word with a basic beat.   (A basic beat is a grid entry on the second metrical level.)

```
                                      x
(3)  Beat Addition (BA)     x ---> x     (optional)
```

       <u>Condition</u>: May not create a stress clash.
       <u>Domain</u> <u>of</u> <u>application</u>: the Intonational Phrase

(4) <u>Stress</u> <u>Clash</u>: Two grid columns on adjacent syllables are clashing if and only if they both have second level grid entries.[3]

BA follows the Text to Grid Alignment rules in (2). The Main Stress Rule gives **permanent** maximal prominence in the word, and this effect can not be undone by BA; grid entries are automatically added to the main stressed syllable, to ensure that the main stress remains stronger than stresses assigned by BA.[4] Some example derivations are in (5) below. The circled entries satisfy the requirement that BA not undo the effect of the Main Stress Rule. The parentheses indicate extrametrical material. I take penultimate stress to be the result of extrametricality. (In the rest of the paper, extrametricality will not be marked.)

```
        Demibeat     x (x)      x  x     x    x x x
(5)     Alignment:   me(lex)    šulxan   a-  mešuga
                     king       table    the-crazy

        Main         x             x
        Stress       x (x)      x  x     x  x x x
        Rule:        me(lex)    šulxan   a-mešuga

                                            ⊗           ⊗
                                          x  x   x      x
        Beat                             x  x x x    x  x x x
        Addition:    inapplicable        a-mesuga or a-mešuga
```

    BA does not apply in any particular direction. It simply picks any unstressed syllable, at random, and assigns it a secondary stress, provided that that wouldn't create a stress clash. This allows generating all the patterns described above. The optionality of BA accounts for the possibility of having sequences of three unstressed syllables. The clash avoiding condition ensures that a secondarily stressed syllable is never adjacent to another stressed syllable.

    In spite of its optionality, BA applies a lot, and does not leave sequences of four or more unstressed syllables untouched. I assume that this is due to a tendency to distribute secondary stresses in the utterance, which is not part of the grammar, and is probably an instance of a general rhythmic principle, which

operates in various different areas (e.g. music). This tendency
is the kind of factor which we would expect to result in more
secondary stresses in slow speech than in fast speech, as is
indeed the case in Hebrew.

   In stipulating that BA applies on the Intonational Phrase, I
accept the position of Bolozky (1983), that BA is strictly late
in the derivation, but not for the reason he gives.[5] It is
crucial for the analysis of stress changes presented in section 2
below that BA applies late in the derivation. It is compatible
with this analysis, though, to let it apply early as well; it
could apply on all the cyclic domains. I have decided to limit
it to the Intonational Phrase, because I think this would allow
for a simpler formulation of the rule assigning the main stress
of the VP.

   Main prominence in Hebrew phrases is always assigned to a
syllable carrying a main word stress (or emphatic stress, which I
will ignore). I haven't studied phrasal stress in any great
detail, but it looks like there is a rule which assigns the
maximal prominence in the VP to the syllable carrying the main
stress of the verb. If BA applies on the Intonational Phrase
only, then the input to this VP rule would not contain any
secondary stresses. For example, for the sentence in (6), the
input to the VP rule would have to be as in (6a).[6]

```
        x               x                       x
        x x     x x x           x       x   x x
(6a)    yosi [vp mexake [pp la-      mazkira]]
        Yosi      waits        for-the-secretary
```

Given this kind of input, the VP rule (which has to assign the
main VP stress to the underlined syllable) can be formulated as
assigning maximal prominence in the VP to the syllable aligned
with the leftmost basic beat in the VP[7]. If BA may apply on all
the cyclic domains, this formulation wouldn't work, because then
the input to the VP rule might contain a basic beat to the left
of the main stress of the verb, as in (6b).

```
                        x                       x
        x       x   x           x       x
(6b)    x x     x x x           x       x   x x
        yosi [vp mexake [pp la-      mazkira]]
        Yosi      waits        for-the-secretary
```

The rule would not be able to pick out the leftmost third level
grid entry either, because there might not be one, due to the
optionality of BA ((6a) is still a legitimate input for the VP
rule), or because BA couldn't apply on the verb without creating
a stress clashy, as in (7).

```
                                              x
            x             x             x   x
          x x x         x x x      x    x  x x
(7)  kulanu [vp xikinu [pp la-      mazkira]]
     we all      waited   for-the-secretary
```

The VP rule would have to be formulated as assigning maximal
prominence in the VP to the syllable aligned with the grid entry
which is alone on its metrical level in the leftmost daughter of the
VP (i.e., the main verb of the VP). This last formulation doesn't
look too implausible; it is analogous to the way the English Nuclear
Stress Rule is formulated in Selkirk (1983). Still, the first
formulation is simpler. In the absence of a spelled-out theory of
"naturalness" or markedness which could determine whether it should
count as simpler to have BA apply on all the cyclic domains or on
the Intonational Phrase only, it seems preferable to choose the
possibility that would allow for a simpler formulation of the VP
rule, and restrict BA to the Intonational Phrase.

3. Stress Changes

3.1 Data

"Stress changes" is a pre-theoretical term referring to
situations where a word appears with a stress pattern different from
the one it has in isolation. Bolozky (1982) presents and discusses
stress changes in Hebrew, and many of the facts presented in this
subsection are given there. I will refer to the stress pattern a
word has in isolation as its "lexical stress", and I will use
"stress shift" and "unstressing" as pre-theoretical terms standing
for different kinds of deviation from the lexical stress.

In Hebrew, only stresses which are very low in prominence can
undergo stress changes. These weak stresses must undergo a stress
change whenever they would otherwise be clashing with another stress
on an adjacent syllable. If a shift would not create a new clash,
the affected stress is shifted. Otherwise, it disappears (it is
"unstressed"). This is illustrated in (9)- (11) below. The
judgements are for normal speech (as opposed to very slow or very
careful), with each sentence pronounced as a single Intonational
Phrase, and with no emphatic stress on atem and lanu. I have
underlined stress clashes.

```
                          ᴗ ⁄      ⁄ ᴗ
(8)  Isolation forms:  atem    lanu
```

```
                   ᴗ ⁄ ᴗ ⁄    ᴗ⁄              ᴗ ⁄ ᴗ    ⁄ ᴗ    ⁄ ᴗ
(9)  No change:  matay atem   baim          kaniti    lanu   oxel
                 when  you-pl come          bought-I  for-us food
                 ('When are you coming?')   ('I bought food for us')

                   ᴗ ⁄       ⁄ ᴗ               ᴗ ⁄    ⁄ ᴗ   ⁄ ᴗ
                 *matay atem__batem[8]       *u  natan_lanu sefer[8]
                 when  you-pl came           he  gave to-us book
                 ('When did you come?')      ('He gave us a book')
```

(10) Stress
     shift:

    ᵕ/ᵕ   /ᵕ   /ᵕ
    meefo   atem   batem
    from-where you-pl came
    ('Where did you come from?')

              ᵕ/   ᵕ/   ᵕ/
    u natan lanu   makot
    he gave   to-us   spanks/blows
    ('He hit/spanked us')

    ᵕ/ /ᵕ /ᵕ
    *matay atem batem

              ᵕ/ ᵕ/ /ᵕ
    *u natan lanu sefer

(11) Unstress-
     ing:

    ᵕ/ ᵕᵕ /ᵕ
    matay atem batem

              ᵕ/ ᵕᵕ /ᵕ
    u natan lanu sefer

The behavior of secondary stresses is analogous to that of
the weak primary stresses which undergo stress changes.
Secondary stresses too never clash with a stress on an adjacent
syllable (see (13a) and (14a)). A secondary stress may appear in
a position where it doesn't clash with another stress, as on ma
in (13b). If that's impossible, there is no secondary stress, as
in (14b).[9]

(12) Isolation forms:

    \ ᵕᵕ / ᵕ   ᵕ \ᵕ / ᵕ
    bamaarexet   bamaarexet

    \ ᵕ /
    yeladim

(13) a. *takala_____bamaarexet
    \ ᵕ /   \ ᵕᵕ / ᵕ
          something going wrong (a noun) in-the-system

      b. takala bamaarexet
    \ ᵕ / ᵕ \ᵕ / ᵕ

(14) a. *šloša yeladim
    ᵕ / \ ᵕ /
         three children

      b. šloša yeladim
    ᵕ / ᵕ ᵕ /

Bolozky (1982, 1983a) says that the only primary stresses
which undergo stress changes are those of function words, like
atem and lanu in (9)-(11) above.[10] I disagree; main stresses
of normal words usually don't undergo stress changes, but when
they are very low in prominence, they sometimes do:

(15)   im ze lo (perek) xamešesre az   ulay   šešesre[11]
                  ᵕ /ᵕ \   ᵕ /   / ᵕ \
       if it not chapter 15   then maybe 16

       Isolation: perek
                  / ᵕ

8   KADMON

(16) im tavou   ⟨lekan⟩ rega ulay i tistakel al ze
      if will-come- to-here minute maybe she will-look on it
      2nd-pl
      ('If you come here for a minute, maybe she will look at it')

      Isolation: lekan

(17) ata   yaxol leaxzik ⟨rega⟩ tasal
      you-sg can   to-hold minute Acc-the-basket
      ('Can you hold the basket for a minute?')

      Isolation: rega

A natural way of pronouncing (15)-(17) is with the circled word
clearly less rhythmically prominent than the two adjacent words.
When pronounced in this way, it is clear that the underlined words
can not retain their lexical stress, although it is hard to tell
whether the stress is shifted or unstressed.[12,13]

3.2 Analysis

     The behavior of secondary stresses is already accounted for
by the rule of BA proposed in section 2. BA never assigns a
secondary stress which would clash with another stress in its
Intonational Phrase. It is clear why some patterns of secondary
stresses that are available for isolation forms are not always
available in larger phrases. Take, for example, yeladim
('children') and šloša yeladim ('three children'). The isolation
form yeladim is an entire Intonational Phrase, in which nothing
clashes with the stress on ye. In the Intonational Phrase
containing šloša yeladim, BA cannot assign a stress to ye next to
ša, so ye must remain stressless.

     I propose that the stress changes which apply to primary
stresses are the combined effect of BA and the rule of Basic Beat
Deletion in (18), which precedes BA.[14]

                                          x
(18) Basic Beat Deletion (BBD)   x ---> x   (obligatory)

              Domain of application: the Intonational Phrase

BBD is a destressing rule, in the sense of Selkirk (1983), and as
such it is restricted by Selkirk's Higher Prominence Preservation
Condition not to delete grid entries on levels three and above.
That is, BBD can only affect stresses which enter the Intonational
Phrase cycle with columns of exactly two grid entries.

     The effect of BBD alone is "unstressing". A "stress shift"
is the result of BBD on one syllable followed by BA on an
adjacent syllable. I assume that by the time of application of
BBD, most of the main word stresses have acquired (at least) a
third level grid entry, assigned by a previous rule. It is the

relatively few primary stresses which have remained very low in
prominence and still have only two grid entries which undergo
BBD.[15] Example derivations are in (19) and (20) below.[16]

(19) Unstressing:

```
                                          x      x    x      x
     Word domain rules (Demibeat Alignment x    x x  x x    x x
     and Main Stress Rule):                u  natan  lanu   sefer
                                           he  gave  to-us  book


                                               x
                                               x            x
     Phrasal rules assigning the main       x   x    x      x
     stresses of the NP sefer and of        x  x x  x x    x x
     the VP:                                 u natan lanu  sefer


                                               x
                                               x           x
                                               x           x
                                           x   x x  x x    x x
     BBD:                                   u natan lanu  sefer


                                               x
                                               x           x
                                           x   x           x
                                           x  x x  x x    x x
     BA:                                    u natan lanu  sefer
```

BA cannot apply to any of the syllables which are still
unstressed, and lanu remains completely stressless.

(20) Stress shift:

```
                              x        x         x
                              x   x    x         x x
     Word domain rules:       u   irbic          lanu
                              he  hit/spanked    to-us


                                  x
                              x   x          X
                              x x  x         x x
     The main VP stress rule: u irbic        lanu


                                  x
                                  x
                              x x  x         x x
     BBD:                      u irbic        lanu


                                  x
                              x   x             x
                              x x  x          x x
     BA:                       u irbic         lanu
```

(BA couldn't have applied to ir or la instead, because
of the stress on bic.)

The specification that BBD is obligatory accounts for the fact that stresses which are weak enough to undergo a stress change may never end up clashing with another stress. BBD applies to **all** the weak stresses. Some of them may then be restored by BA (e.g., the stress on u̱ in (19) and (20) above), but not the ones which would clash with another stress (like the stress on ḻa in (20)).

Note that it is not necessary to stipulate a movement rule to account for the stress shift. The shift is the result of two independently motivated rules, needed for secondary stress assignment and for unstressing. Using BBD for both unstressing and the stress shift captures the similarities between the two processes. (They basically occur in the same environment, the shift being "chosen" when it wouldn't create a stress clash.) Using BA both for secondary stress assignment in general and for the stress shift explains why they yield the same clashless stress patterns.

My analysis correctly predicts that in situations like in (22) below, where a clash could arise between a weak primary stress and a secondary stress, either one of the two stresses may be supressed or shifted so as to prevent the clash.

(21) Isolation forms: ata   meakenes

(22) *ata____meakenes   ata meakenes   ata meakenes
     you-sg from-the conference
     ('You are from the conference')

The stress on ṯa enters the Intonational Phrase cycle with two grid levels only. After BBD applies to it, the only basic beat in the phrase is on ḵe, and BA may add a beat to either one of ṯa or m̱e.

Under my analysis, there is no distinction between the assignment of main stresses to function words and to other words. All primary stresses come out of the word cycle with exactly two grid levels.[17] This allows for a unified treatment of stress changes, wherever they occur.[18]

Since main stresses of normal ("lexical") words don't undergo stress changes as often as main stresses of function words do, I do have to assume that main stresses of normal words are more likely to be strengthened (to three or more grid levels) than main stresses of function words are. Unfortunately, this cannot always be attributed to differences between the syntactic configurations in which normal words and function words occur (differences which affect the assignment of main phrasal stresses). There is a limited number of syntactic positions (perhaps only subject positions) in which a function word may undergo a stress change and a normal word may not.[19] For example, compare the proper name y̱ael in (23) below with the

function word <u>atem</u> (isolation: a<u>tem</u>) in <u>matay</u> <u>atem</u> <u>batem</u> (from
(11) above)).

(23) *<u>matay</u> yael baa   matay yael baa   Isolation: yael
      when Yael came-fem
      ('When did Yael come?')

In the context of the present analysis, this seems to indicate
that rules assigning main phrasal stresses are sensitive to
whether words are function words or "lexical" words. The account
might go as follows, for example. The phrasal rules do not
"count" a function word alone as a full phrase. An NP domain
rule adds a third level grid entry to <u>el</u>, the most prominent
syllable in the NP <u>yael</u>, but fails to "see" that <u>atem</u> is also an
NP and strengthen the stress on <u>tem</u>.

3.3 A Rejected Alternation

A possible alternative approach would be to say that BBD is
triggered by a clash. That is, it could delete all the basic
beats which are clashing with another stress, instead of deleting
all of the basic beats. Here are some arguments against this
approach.

First, there are examples like (24).

(24) kaniti   lanu   bananot   Isolation: lanu
      bought-I for-us bananas

In my dialect, it is much more natural (in normal speech) to
pronounce the sentence in (24) as marked than to retain the
lexical stress on <u>lanu</u>, although a stress on <u>la</u> wouldn't clash
with a stress on an adjacent syllable. It is not at all clear
how stresses on <u>ni</u> and <u>la</u> could somehow count as clashing. Even
if they could, that would be due to an ad hoc definition of a
clash, needed only for BBD, and necessarily different from the
definition of the clash avoided by BA (since BA **can** restore the
stress on <u>la</u>; cf. <u>kaniti</u> <u>lanu</u> <u>oxel</u>, from (9) above).

Next, consider again <u>ata</u> <u>meakenes</u>, from (22) above. The
isolation form of <u>ata</u> is <u>ata</u>, so BBD must have applied to <u>ta</u>.
BBD couldn't have been triggered by a clash with the stress on
<u>me</u>, since this stress wasn't there when BBD applied – it is a
secondary stress, assigned by BA after BBD has applied. (BA
couldn't possibly have assigned the stress on <u>me</u> before BBD
applied to <u>ta</u>, because BA is clash avoiding.) Therefore, a clash
can't be a necessary condition for the application of BBD.

Finally, a very theory internal point: If BBD were
triggered by a clash, it couldn't be considered a destressing
rule, in which case there would have to be a special stipulation
that constrains it to apply only to weak basic beats.

3.4 A Problem

My analysis alone does not account for the fact that <u>oto</u> in (25) cannot undergo a stress shift.

(25) *išarti oto babait   išarti oto babait   Isolation: otó
       left-I him in-the-home
       ('I left him at home')

<u>oto</u> must be low enough in prominence to undergo BBD: First, it does undergo a stress shift when the following word is stressed initially, as in (26).

(26) išarti oto kan   (<u>kan</u> is more prominent than both
      left-I him here   syllables of <u>oto</u>)

Secondly, <u>lanu</u> in (24) (<u>kániti lánu banánot</u>) is low enough in prominence to undergo BBD, and, as far as I can tell, the rhythmic structures of (24) and the grammatical form in (25) are identical. Why can't <u>oto</u> undergo a stress shift, then?

Recall that in the example in (24) the stress pattern <u>lánu</u> is much more natural than the lexical <u>lánu</u>.[20] Why? I believe that the answer to this, as well as to the question posed by (25), is that there is a preference for final stress, which makes BA assign final stress whenever that is possible (i.e., when it wouldn't create a stress clash). BA assigns a stress to the last syllable of the function word, in both (24) and (25). I think this is obligatory. The reason <u>lánu</u> in (24) is nevertheless marginally acceptable is analogy to more formal speech, where all lexical patterns are retained, or analogy to cases where <u>lanu</u> is emphatically stressed. When <u>oto</u> is emphatically stressed, or in formal style, <u>oto</u> always has final stress, so there isn't a parallel reason to accept <u>ótŏ</u> in (25). I don't know what is the best way to encode the preference for final stress in the grammar.

4. <u>e</u> Deletion and its Interaction with Stress Changes

4.1 e Deletion

In Modern Hebrew normal speech (as opposed to particularly slow or particularly careful speech), there is optional deletion of vowels which are morphologically or phonologically predictable. To the best of my knowledge, this vowel deletion was first discussed in Bolozky (1977). As a general, systematic phenomenon, the deletion is restricted to the vowel e, and in some limited morphological environments, also i. I will limit my discussion to the deletion of e, and refer to the rule deleting it as 'e Deletion' (e Del). Examples are given in (27).

(27) a. šloša yeladim   ——opt.——>   šloša yladim
          three children

```
         \ ∨ /        ∨ /                         ∨ / ∨ /
b. i    mevina      oti      ──opt.──→   i mvina oti
   she understands me
```

```
         ∨ / ∨ ∨ /                              ∨ /  ∨ /
c. i    košeret oti       ──opt.──→    i košert oti
   she ties     me
```

```
   ∨ / ∨    ∨ /                          ∨ /  ∨ /
d. akelev  aze      ('this dog')  ──opt.──→  akelv aze
   the-dog the-this
```

All of the deleted vowels in (27) are predictable vowels. The one in (a) is phonologically predictable – it is there to break an impermissible syllable-internal consonant cluster (yl); the ones in (b) and (c) are in affixes (verb inflection affixes); the deleted e in (d) is typical of a certain noun pattern (the "Segolate" nouns).[21]

Like Bolozky (all references), I assume that the Ø/e alternation in Hebrew has to be accounted for by an e deletion rule and not by an e insertion rule. There is no phonologically specifiable environment in which the insertion rule could take place. Take for example (28) and (29).

```
            ∨ /  ∨ /                            ∨ / ∨  ∨ /
(28) a. i   košert oti              i košeret oti (=(27c))
        she ties   me
```

```
                   ∨ /  ∨ /
     b. at         kašart oti        *at kašaret oti
        you-sg-fem tied    me
```

```
            ∨ /      ∨ /                     ∨ / ∨  ∨ /
(29) a. i   olext    elav             i olexet elav
        she goes/walks to-him
```

```
                   ∨ /    ∨ /
     b. at          alaxt   elav        *at alaxet elav
        you-sg-fem went/walked to-him
```

The underlined e in (28a) and (29a) is part of the inflection for present tense (fem., sg.). Its presence can't be the result of a phonological insertion rule; such a rule would not be able to distinguish between the a examples and the b examples in (28) and (29). The presence of the e in the a examples and its absence in the b examples (typical of the past tense) are morphological facts which have to be memorized by the speaker.

As noted in Bolozky (1977), e Del is constrained to yield a string which is properly syllabifiable (across a word boundary). Compare the e-less versions in (27) above with the e-less versions in (30). The latter cannot be syllabified without violating constraints on syllable structure in Hebrew.

(30) a. šloším yeladím   *šlošim yladim
          thirty children

     b. at   mevína   otí   *at mvina oti
         you-sg-fem understand me

From now on, I will only discuss examples where the e to be deleted is predictable, and the syllabificaton requirement is met.

4.2 The Anti-Clash Constraint on e Deletion

     e Del may result in a neat alternation of stressed and unstressed syllables, as in (27) above, or create a sequence of unstressed syllables, as in (31).[22] It never results in a stress clash, as illustrated by the contrast between the a and the b examples in (32) and (33).

(31) asáfa   ameduberét $\xrightarrow{opt.}$ asafa amduberét
      the-language the-spoken
      ('the spoken language')

(32) a. i olexet eláv $\xrightarrow{opt.}$ i olext eláv (=(29a))
         she walks to-him

      b. i olexet ena   *i olext ena
         she walks (to)here

(33) a. bemešex ayóm $\xrightarrow{opt.}$ bemešx ayóm
         during the-day

      b. bemešex ašana   *bemešx ašana
         during the-year

     The anti-clash constraint which affects e Del is not a global constraint on Hebrew stress patterns. In the same syntactic envirnoments where e Del can't create a clash, stress clashes which are not created by e Del are allowed to surface, as in (34). (Compare (34) with (32b) above.)

(34) at aláxt ena   at aláxt ala
      you walked (to)here you walked further

Therefore, the anti-clash constraint can't be a filter on some level of the derivation; such a filter would fail to distinguish between examples like the ones in (34) and examples like *i oléxt ena (from (32b)). Similarly, the facts could not be dealt with

by positing an e insertion rule triggered by a stress clash,
because such a rule would also fail to make that distinction.
(And, moreover, *at ăláxĕt énă/álă is ungrammatical.) In the
light of this, it seems that the anti-clash constraint has to be
analyzed as a condition on the application of a rule.

4.3 e Deletion and Stress Changes (Data)

As noted in Bolozky (1977), sometimes a stress change makes
it possible for e Del to apply and yield a grammatical string.
Examples are in (35)-(38) below. e Del cannot apply to the a
examples to yield the b examples, because that would create a
stress clash, but the c examples, where a stress change has
occurred, are fine.

(35) a.   ătá   ŭmevín   ŏti   Isolation: ătá
     you-sg-masc understand me

   b. *ata mvin oti

   c. ata mvin oti   (shift)
                    (adapted from Bolozky (1977), p. 132)

(36) a. mimatay   ata mevin   oti kol kax tov
     since-when you understand me   so   well

     Isolation: ata

   b. *mimatay ata mvin oti kol kax tov

   c. mimatay ata mvin oti kol kax tov   (unstressing)

(37) a. ani xozeret   ena   axar kax   Isolation: ena
     I   return-fem (to)here afterwards

   b. *ani xozert ena axar kax

   c. ani xozert ena axar kax   (shift)

(38) a. ani xozeret ena   texef   Isolation: ena
     I   return (to)here immediately

   b. *ani xozert ena texef

$\smile$ / $\smile$ $\smile$ / $\smile$
c.   ani xozert ena texef   (unstressing)

A similar pattern arises when e Del "threatens" to create clashes involving secondary stresses, as illustrated in (39) below (an extension of (33b)).

$\smile$ / $\smile$ \ $\smile$ /
(39) a.   bemeŝex aŝana   Isolation: aŝana[23]

$\smile$ / \ $\smile$ /
b.   *bemeŝx aŝana

$\smile$ / $\smile$ $\smile$ /
c.   bemeŝx aŝana

4.4 Analysis

Given the analysis of stress changes developed in 3.2 above, the interaction between e Del and stress changes can be accounted for by adding the following two claims: (i) e Del **follows** BBD; (ii) There is a condition on the application of e Del, that it may not create a stress clash, where a clash is defined as in (4), repeated below (i.e., it is the same notion of clash which is relevant to BA).   e Del, then, is as in (40).

(40) e Deletion   Delete the vowel e.[24]   (optional)
            Condition: May not create a stress clash.[25]
            Domain of application: the Intonational Phrase

(4)   Stress Clash: Two grid columns on adjacent syllables are clashing if and only if they both have second level grid entries.[3]

I have mentioned three facts about e Del which are not in (40): it follows BBD, it has to result in a syllabifiable string, and it only deletes e's which are phonologically or morphologically predictable.   These facts are likely to be derived from independent principles of the grammar.   Otherwise, they should be stipulated as additional conditions on the application of e Del. My analysis is illustrated by the following derivations of (35c), (38c) and (39c).   As the reader can easily verify, the ordering of BA after e Del is not crucial; being optional, BA could just as well precede e Del.[26,27]

(41) Word domain rules (Demibeat   x   x   x
            Alignment and Main Stress Rule):   x x x x x x
                                               ata mevin oti

```
                                        x
                            x     x     x
                          x x   x x   x x
The main VP stress rule:   ata mevin oti


                                  x
                                  x
                          x x   x x   x x
BBD:                       ata mevin oti


                                  x
                                  x
                          x x   x   x x
e Del:                     ata mvin oti


                                  x
                            x     x     x
                          x x   x   x x
BA:                        ata mvin oti
```

(BA can't assign a stress to <u>ta</u> instead, because of the
stress on <u>mvin</u>. Of course, e Del didn't **have** to apply,
since it is optional. If it hadn't, BA could have
assigned a stress to <u>ta</u>, to derive (35a) (a̋tá̋ me̋ví̋n
öti̋). BA **would** have done that, in fact, because of the
preference for final stress discussed in 3.4 above.)

(42)   Word domain rules:
```
                          x     x     x     x
                        x x   x x x   x x   x x
                         ani xozeret ena texef
```

```
                                  x
                                  x           x
                          x     x     x     x
Rules assigning main stresses  x x   x x x   x x   x x
of phrases:                    ani xozeret ena texef
```

```
                                  x
                                  x           x
                                  x           x
                          x x   x x x   x x   x x
BBD:                       ani xozeret ena texef
```

```
                                  x
                                  x           x
                                  x           x
                          x x   x x   x x   x x
e Del:                     ani xozert ena texef
```

```
                                  x
                                  x           x
                          x     x           x
                          x x   x x   x x   x x
BA:                        ani xozert ena texef
```

18 KADMON

(BA can't apply to any of the syllables of ena, and
this word remains completely stressless. If e Del
hadn't applied, BA could have assigned a stress to e,
to derive (38a) (aní xózérět éna texef).)

```
                                          x          x
                                          x x x  x x x
(43)   Word domain rules:                 bemešex ašana


                                          x          x
                                          x          x
       Rules assigning main stresses      x x x  x x x
       of phrases:                        bemešex ašana

       BBD:                               inapplicable


                                          x          x
                                          x          x
                                          x x    x x x
       e Del:                             bemešx ašana

       BA:                                inapplicable
```

(If e Del hadn't applied, BA could have assigned a
stress to a, to derive (39a) (bémešéx ašaná).)

4.5 A Rejected Alternative

Bolozky (1983a) proposes a different acount of the
interaction between vowel deletion and stress changes. He too has
three rules, corresponding to my BA, BBD, and e Del, but his
vowel deletion rule **precedes** the destressing rule, and it is **not**
constrained not to create a stress clash. For example, Bolozky
(1983a) derives (35c) as follows (I will use my own terms for
the rules). We start with atá mevín otí. e Del (allowed to
create a clash!) gives atá mvín otí. Then, BBD gives
atá mvín otí, and, finally, BA gives atá mvín otí.
The surface form can't contain a clash, because the clash avoiding
BA cannot assign a stress to ta.

The account of Bolozky (1983a) doesn't work for cases where
e Del results in a clash between two main word stresses which
can't be destressed. For example, it fails to rule out (44b).

(44) a. axi   mevin   oti   b. *axi mvin oti
          my-brother understands me

Examples like (44) show that it is impossible to get away with
referring to a stress clash only in the description of BA, as
Bolozky has tried to do.

Is it possible to retain the rule ordering of Bolozky
(1983a) and say that e Del may create a clash (in its immediate

output), provided that the clash is eliminated later in the
derivation? Yes, but it would mean that the stress condition on
e Del is a constraint which involves more than one level of the
derivation.

My analysis, where e Del may not create a stress clash,
succeeds in ruling out (44b), without positing an undesirable
constraint: The source for (44b) would have been (44a), and
neither of BBD, BA and e Del can apply to axi and mevin in this
form (the stresses on xi and vin being too strong to undergo
BBD). Of course, if e Del may not create a stress clash, it must
follow BBD (otherwise, stress changes could not enable e Del to
apply).

FOOTNOTES

*I would like to thank Shmuel Bolozky, Mark Feinstein, Scott
Myers and Lisa Selkirk for a lot of helpful discussion. Thanks
to the anonymous UMOP reviewers for the comments and for the good
advice about how to rewrite this paper. Thanks to Shmuel
Bolozky, Dorit Abusch and Yachin Cohen for judging loads of data.

[1] I partly disagree with Bolozky (1982) about the available
patterns. See Kadmon (1983) for more detail. I am still
convinced that sequences of three **completely** stressless syllables
(equally low in prominence) do occur, a claim disputed in Bolozky
(1983c).

[2] The diacritics, in (1) and throughout this paper, mark
relative prominence in the word, rather than in a larger domain. I
am using hyphens to indicate the prefixes.

[3] Basic beats on two syllables separated by several word and
phrase boundaries, but not an Intonational Phrase boundary,
should count as clashing, since BA can't create such sequences of
basic beats. (I am using 'boundaries' metaphorically.) If there
are silent demibeats at the boundaries (see Selkirk (1983)), BA
ignores them. Therefore, if disjuncture in Hebrew should be
represented on the grid by silent demibeats (maybe it shouldn't),
then the definition of a clash has to refer to adjacency on the
string of syllables, and not on the grid. See discussion and
data in Kadmon (1983).

[4] The requirement that BA not undo the effect of the Main
Stress Rule should follow from some version of the universal
Textual Prominence Preservation Condition of Selkirk (1983).

[5] Bolozky's reason is that he wishes to avoid derivations
where secondary stresses are assigned, then destressed, and then
assigned back again at the same place and by the same rule. I
think there is nothing a priori wrong with this kind of

20   KADMON

not a Grid Euphony rule.   Either the class of destressing rules
should be extended to include rules like the Hebrew BA, or else
the Hebrew BA is a post cyclic rule.

[15] I know of two factors which strengthen primary stresses
(to three or more grid levels):   the rules assigning the main
prominences in phrases (like the VP rule mentioned in section 2),
and the rule or convention assigning high prominence to syllables
carrying a pitch accent.   (The latter explains the fact (noted by
Bolozky) that emphatically stressed ("highlighted") function
words, i.e., function words with a pitch accent, cannot undergo
stress changes.)   Further research is needed in order to
determine whether more factors are involved in strengthening the
stresses which can't undergo a stress change.

[16] The columns of three or more grid entries might end up
higher than indicated, depending on the way main phrasal stresses
are assigned.

[17] Note that it is impossible to say instead that primary
stresses which can undergo stress changes come out of the word
cycle weaker than other primary stresses, since there is no
syntactically or morphologically definable class of words which
rule(s) applying on the word domain could recognize as the class
of words that are to be assigned weaker stresses.

[18] In 3.3 below, I give examples of main stresses of function
words undergoing a stress change although a failure to do so
would not result in a stress clash.   Bolozky (1983c) claims that
main stresses of normal ("lexical") words are different, in that
they only undergo stress changes under clash.   I disagree with
this claim.   I find Bolozky's examples of such stresses
undergoing a stress change **not** under clash (assigned two
question-marks by him) just as good as the examples of these
stresses undergoing a stress change under clash.   Therefore, I
think there should be a unified account of the stress changes
applying to all stresses.

[19] In other positions where function words undergo stress
changes, there isn't a normal word to compare to.   For example,
lánŭ, the function word indirect object of u irbic lánŭ,
undergoes a stress shift, but any "lexical" indirect object would
be preceded either by a full preposition or by a prefixal one.
In the first case, it would not be in the same position as lanu,
and could not be contrasted with it.   In the second case, there
wouldn't be any stress to undergo a stress shift, since prefixes
don't have lexical stress.

[20] There are some dialectal variations here.   I am referring
to my own dialect, which, I am told, is typical of speakers from
Tel-Aviv.

[21] See Bolozky (1983b) for an extensive discussion of which
e's are the "predictable" ones, that may be deleted.

[22]Bolozky (1977) assumes that e Del yields a neatly alternating stress pattern, but Bolozky (1983a,b) agrees with me that it can yield less regular patterns as well, as long as it doesn't create a stress clash.

[23]If this is the only isolation pattern, (39c) is a case of "unstressing". See fn.9.

[24]For all I know, the grid column of the syllable which contains the deleted e (a syllable which is eliminated by e Del) remains in the grid and has no phonetic effect. If a clash is defined in terms of syllable adjacency (see fn.3), the syllable-less column would be irrelevant to stress clashes.
Or, the grid column might disappear because of some convention. This is particularly plausible if Hebrew doesn't have silent demibeats (see fn.3).
An alternative formulation of the rule of e Del would have it delete a grid column, instead of deleting a vowel. In that case, there might be a convention which gets rid of the "maked" e after it has lost its grid column. (If the convention applies only to e, that could explain why other vowels are not affected – deleting their grid column would result in an ill formed representation containing a naked vowel.) The rule would then be a stress rule. Formulating e Del as a stress rule was suggested to me by Scott Myers, and, independently, by Junko Ito and Armin Mester.
I am not convinced that this formulation has any real advantages. One might argue that it is desirable to exclude segmental rules which affect grid structure. But if the grid column of the deleted e remains, then e Del does not affect grid structure. As for excluding conditions on segmental rules which make reference to grid structure, that is not generally possible. There are segmental rules other than the Hebrew e Del which are sensitive to stress (e.g., the English vowel reduction).

[25]Or, equivalently: May not delete an e from the second

$$
\begin{array}{ccc}
 & x & x \\
 & x & x & x \\
\end{array}
$$

syllable in the configuration $\sigma\ \sigma\ \sigma$.

[26]In an earlier version of this paper, I have claimed that BA precedes e Del. I am grateful to an anonymous UMOP reviewer and to Bolozky (1983c) for pointing out to me that that was not a necessary assumption.
Bolozky (1983c) argues that there are reasons to order BA after e Del, but I believe that his arguments are inconclusive.

[27]As usual, some of the columns with a third level grid entry may be higher than indicated. (See fn.16.)

REFERENCES

Bolozky, Shmuel (1977) "Fast Speech as a Function of Tempo in Natural Generative Phonology", Journal of Linguistics 13, pp. 153-168.

Bolozky, Shmuel (1982) "Remarks on Rhythmic Stress in Modern Hebrew", Journal of Linguistics 18, pp. 275-289.

Bolozky, Shmuel (1983a) "Subsidiary Stress in Modern Hebrew" (early version), University of Massachusetts ms.

Bolozky, Shmuel (1983b) "On 'Derived Environment' in Casual Modern Hebrew", University of Massachusetts ms.

Bolozky, Shmuel (1983c) "Subsidiary Stress in Modern Hebrew" (new version), University of Massachusetts ms.

Kadmon, Nirit (1983) "Vowel Deletion and Stress Changes in Modern Hebrew", University of Massachusetts Generals Paper (ms.).

Liberman, Mark (1975) The Intonational System of English, Ph.D. Dissertation, MIT.

Liberman, Mark and Alan Prince (1977) "On Stress and Linguistic Rhythm", Linguistic Inquiry 8.2, pp. 249-336.

Prince, Alan (1983) "Relating to the Grid", Linguistic Inquiry 14.1, pp. 19-100.

Selkirk, Elisabeth (1983) Phonology and Syntax: The Relation Between Sound and Structure, MIT Press.