Is Plane Conflation Bracket Erasure?*

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I. Introduction

McCarthy (1981) shows very convincingly that features belonging to distinct morphemes are assigned to distinct planes when morphological concatenation takes place as we see in (1). If features of distinct morphemes are represented on the same plane as in (2), association of features to the available skeletal slots will be blocked because of the association line crossing constraint.

(1)   k   t   b   (2)   k a t   b
       | | | | ⌐+⌐⌐ |
       C V C V C   *C V C V C
            \ /
             a

At some point in the derivation, it has been assumed that these distinct multi-planes are collapsed into a uni-plane by a convention referred to as Plane Conflation (Younes1983, McCarthy1986). For example, spirantization in Tiberian Hebrew (McCarthy, 1986) which affects a post-vocalic stop affects only a part of a long-distance geminate.
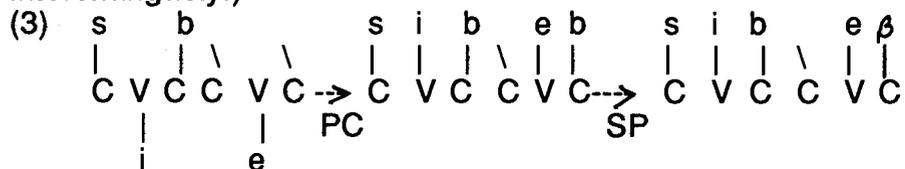
Spirantization in Hebrew then is assumed to take place after Plane Conflation. (Hereafter, we will use Plane Conflation and PC interchangably.)

(3)
```
      s   b                s  i  b  e b          s  i  b   e β
      |   |\   \           |  | |\ ||           |  |  | \  | |
      C V C C  V C -→  C  V C  C V C--→   C  V C  C  V C
          |       |    PC                 SP
          i       e
```

In this paper, we will tentatively assume the following definition of Plane Conflation which is generally assumed by many phonologists.

(4) Plane Conflation

a. After a certain point in the derivation, only one tier for each feature is allowed. When several tiers of the same melody are conflated into one, no phonological information is added or lost.

b.
```
      k   t   b           k  a  t  a  b
      |   |   |           |  |  |  |  |
      C V C V C----→      C  V  C  V  C
       \   /   PC
        a
```
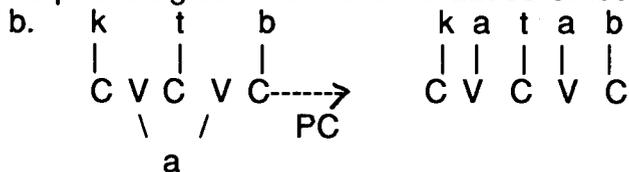
Noticing that Plane Conflation is an independently necessary convention in non-concatenative morphology and Bracket Erasure is also necessary in Lexical Phonology, McCarthy (1986) suggests that Plane Conflation replace Bracket Erasure, which is usually assumed to take place at the end of each lexical stratum in Lexical Phonology (Kiparsky, 1982). His idea can be roughly summarized as (5).

(5) McCarthy (1986)
Every morpheme has its own plane.
Plane Conflation might replace Bracket Erasure.

Following Sproat (1985) and others, however, Cole (1987) suggests that there is no Bracket Erasure in Lexical Phonology at the end of each lexical stratum. Rather the only place where Bracket Erasure takes place is at the end of the lexical phonology. Cole suggests that the Plane Conflation take place at the end of Lexical Phonology.

(6) Cole (1987)
Separate morphemes if and only if separate planes. Plane Conflation takes place only at the end of lexical phonology. However, Plane Conflation for the stem may apply after the stem morphemes have been concatenated: this is language particular.

Yip (1988) has a different idea about Plane Conflation. She questions McCarthy's proposal that Plane Conflation automatically simplifies heteromorphemic identical segments such as (7a) into (7b):

(7) a.   t   b.   t

        | / \

      C + C   C C

        |

        t
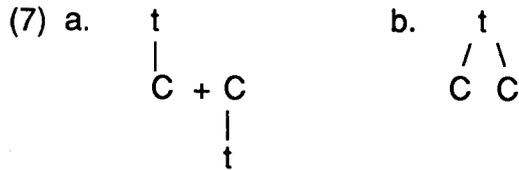
Note that there is no stage of the derivation, under this view, in which an OCP violation exists. Yip rather suggests that rules such as dissimilation across morpheme boundaries, epenthesis into heteromorphemic identical clusters, etc should take place after the PC since heteromorphemic melodic elements can only be adjacent after Plane Conflation. Thus, she suggests any rule that refers to both elements, and in which they are clearly distinct, is evidence against the automatic fusion effect displayed in (7). Yip suggests that PC sometimes take place before Bracket Erasure (hereafter we will use Bracket Erasure and BE interchangably). Yip's (1988) suggestion is roughly summarized in (8).

(8) YIP (1987)

There are two stages of Plane Conflation:

First Stage: the OCP-related rules trigger Plane Conflation

Second Stage: At the end of lexical stratum

The point at which Plane Conflation applies can be determined in various ways: one way is to examine the rules which should apply before Plane Conflation and define their characteristics. Another way would be to examine the (lexical) rules which should take place after Plane Conflation such as those that Yip (1988) has suggested and make some specific suggestions when Plane Conflation applies. In this paper, we will discuss some of the rules which have been claimed to take place before PC and determine how compelling they are as evidence that PC is BE.

II. Antigemination

One rule type which apparently must take place before Plane Conflation is lexical syncope. McCarthy (1986) has noticed that a lexical syncope rule is blocked if the result of which is two identical consonants. However, if the two identical consonants belong to the different morphemes, no such blocking occurs. That is, these lexical syncope rules apply before Plane Conflation.

Wise (1983) notes that in one dialect of Tunisian Arabic, that of a small village community (Ouled Yange) on the island of Kerkenna, a similar antigemination effect is observed. This dialect has the following rules.

(9)   V ----→ø / X C ___ C V (C) #

      [-stress]

where X ≠ # (i.e. the vowel is in a non-initial syllable)

Optional where V is [-hi]

(10) VCCCV --> VCCV
         123   13
where   C = C
           2   3

These rules operate independently of the grammatical environment. But a special case arises if the geminate consonant is identical with the consonant which follows. In the case of nouns, adjectives and participles the rules operate normally as in (12).

(11)   m-Sammim   m-Samm-a
       'determined (masculine)'   'determined (fem)'
       mit-rassis   mit-rass-a
       'angry(masc)'   'angry (fem)'

(12) m-Sammim-a   --->   m-Sammm-a--->   m-Samm-a
                     (9)   (10)

On the other hand, if the grammatical environment is a verb of the form CVCCVC+suffix, truncation and reduction do not take place as shown in (14):

(13)   rassis + u --->   rassisu *rassu   'they angered'
       qarrar + u --->   qarraru *qarru   'they decided'

(14)   rassis + u --(9) is blocked due to ANT--> rassisu *rassu

If this is the case, why does the Antigemination block Syncope rule (9) in verbal stems, whereas it does not in nouns, adjectives and participles? Several suggestions can be made. The first one will be by stipulating that Syncope rule (9) applies after PC of stems for verbs, thus triggering the antigemination effect, whereas it applies before PC for nouns, adjectives and participles. However, this suggestion seems to be an ad-hoc stipulation, exploiting the relationship between Plane Conflation and Antigemination rather than providing an explanation with any independent motivation.

The second suggestion might be giving the domain for the Antigemination such as (15).

(15) Antigemination: domain: verbal stems

Though this suggestion seems to be as ad-hoc as the first one, in the next example we see some motivation for this suggestion.

Another example where we might see the interaction of a lexical syncope rule and Plane Conflation is Tiberian Hebrew. The following facts are noted by Odden (1986). McCarthy (1986) shows that there is a lexical syncope rule in Tiberian Hebrew. This syncope rule applies after Plane Conflation of the stem level, i.e. level 1, but before Plane Conflation of the stem+ suffix level, i.e. level 2. Tentative rule formulations for Spirantization and Schwa Deletion in Tiberian Hebrew are given in (16) and (17).

(16) Tiberian Hebrew Spirantization

$$C \longrightarrow C \ / \ V \ \underline{\qquad}$$
$$\text{[+cont]} \qquad \text{[-son]}$$

(17) Tiberian Hebrew Schwa Deletion

$$ə \rightarrow ø \ / \ V \ C \ \underline{\qquad} \ C \ V$$

(18) a.
```
                u                          u
                | \                        | \
    C V V C V C + V V   ----→   *C V V C C + V V
    | | / | | |         (17)     | | / | |
    s a b ə b                    s a b b
```

b.
```
        ə n i                          n i
        | | | \                        | | \
    C V C + V C V V   ------→   C V C +  C V V
    | | |             (17)      | | |
    h i n                       h i n
```

In (18a), Schwa Deletion is blocked by Antigemination: Schwa deletion will result in identical consonants on the same plane, and thus it is blocked by the OCP. However, in (18b) Schwa Deletion does apply between heteromorphemic identical consonants since the stems and the suffixes of the relevant forms are represented on separate planes: no OCP violation occurs.

Rappaport (1984) and McCarthy (1986) note that Spirantization (16) should precede Schwa Deletion as is shown in (19).

(19) ta-paarek-əkaa   --→   ta-ßaareɣ-əɣaa   --→   ta-ßaareɣ - ɣaa
                 (16)   (17)

However, the problem is the following case in (20):

(20)
```
                      t i                          t i
                      | |                          | |
    C V V C V C + C V   ----→   *C V V C V C + C V
    | \ / | | |         (16)     | | / | | |
    k a r a t                    k a r a θ      [karatti]
                    'I cut' (McCarthy 1986)
```

Hetero-morphemic identical consonants behave as if they were real geminates, thus showing the inalterability effect and do not undergo spirantization (16). To explain this fact, we have to assume that fusion has taken place, which McCarthy claims is a side-effect of PC as is shown in (21) and Spirantization takes place after, not before, PC of level 2.

(21)
```
    k   a   r   a   t   i
    | / \   | | / \ |
    C V V   C V C C V
```

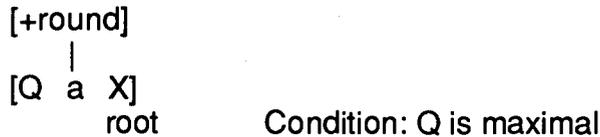## III Lexical Rules before Plane Conflation

In this section, we will examine some phonological rules which have been suggested to take place before Plane Conflation and try to generalize their characteristics. We will start with the Chaha Palatalization and Labialization rules discussed in McCarthy (1983, 1985, 1986).

McCarthy (1983, 1985, 1986) shows that Chaha has morphological mutation rules of palatalization and labialization. These rules mark that mark certain morphological categories either by themselves or with following suffixes. He suggests that these rules are triggered by feature-sized morphemes which have their own planes. Rules given by McCarthy are shown in (24).
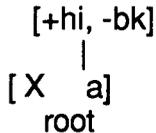
(24)
a. Chaha Labialization
Attach [+round] to the rightmost labializable (labial or velar) consonant in the root.

    [+round]
       |
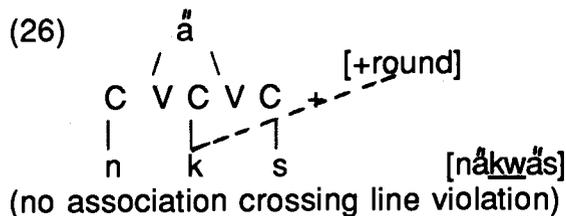   [Q a X]
          root   Condition: Q is maximal

b. Chaha Palatalization
Attach [+high, -back] to the last root consonant if it is palatalizable (coronal or velar).

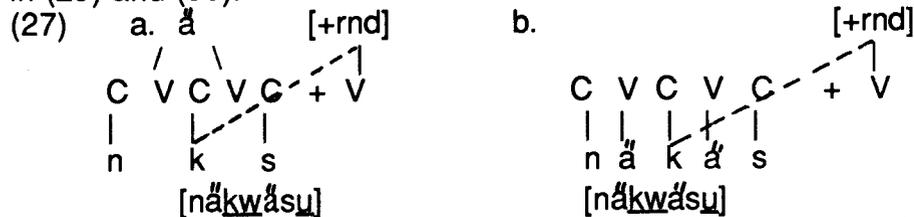   [+hi, -bk]
        |
    [X   a]
       root

If the palatalized or labialized root consonant is the result of an autosegmental spreading or reduplication, the secondary articulation appears on all the surface copies of the consonant. The following examples are from McCarthy (1983, 1986).

(25)   a. Personal   Impersonal
          nákás   nákwás   'bite'
          sákák   sákwákw   'plant in the ground'
       b. Masculine   Feminine
          bátət   bátyəty   be wide'
          səkək   səkyəky   'plant in the ground'

How is it possible that the suffix can affect all the copies of the root consonant? It works as follows: first, the rule takes place prior to Plane Conflation. Secondly, the suffix as a morpheme has its own plane and it affects the root tier directly without violating the association line constraint --- that is, the representation at this point is that of multi-planes in (26).

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(24)

a. Chaha Labialization

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$$[+round]$$
$$|$$
$$[Q \quad a \quad X]$$

       root   Condition: Q is maximal

b. Chaha Palatalization

Attach [+high, -back] to the last root consonant if it is palatalizable (coronal or velar).

$$[+hi, -bk]$$
$$|$$
$$[X \quad a]$$

   root

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(26)
```
           a̋
         /   \           [+round]
     C  V  C  V  C _+_ - - -
     |     |__ __|
     n     k     s          [nǎkwǎs]
```
(no association crossing line violation)

However, the reasons given above do not quite explain this phenomenon. If these are the only reasons for allowing the labialization in this fashion, we would expect a hypothetical language where the same phenomenon takes place but the trigger is an actual segment as in (29) and (30).
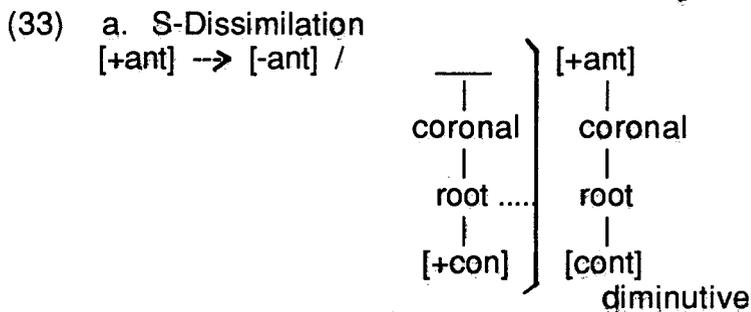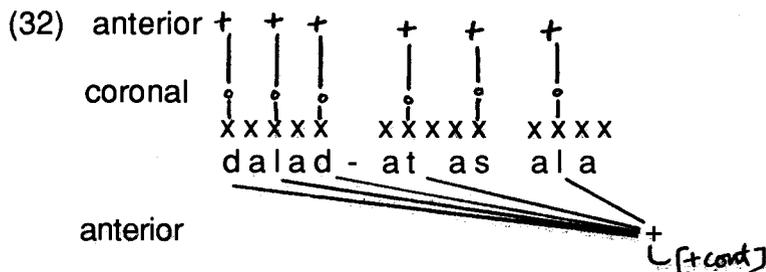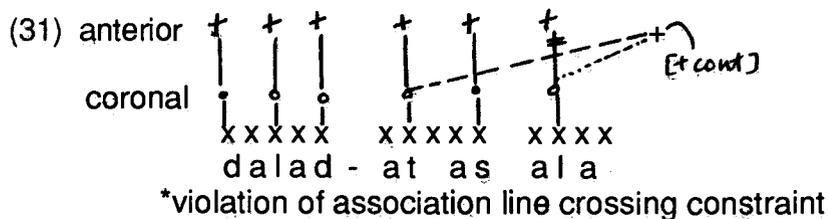
(27)   a. a̋   [+rnd]   b.   [+rnd]
```
        /  \       _ -1                                         _ -1
     C  V  C  V C - + V                  C  V  C  V  C - + V
     |     |__ _|                        |  |   |_|_|
     n     k   s                         n  ǎ  k  ǎ  s
        [nǎkwǎsu̠]                            [nǎkwǎsu̠]
```
The [+rnd] vowel is a suffix and therefore has its own plane in (27a) and (27b). As is the case in (26), there is nothing to block the direct spreading of [+rnd] feature of the suffix to the velar [k] in the root tier. I know of no languages which show such a powerful rule, and if such a rule were allowed, it would be difficult to define a locality condition in a lexical stratum.

If this observation is right, we must try to explain it. It seems to me that the only difference between (26) on the one hand and (27a) and (27b) on the other hand is that the trigger in (26) is a floating feature whereas in (27a) and (27b), the trigger is an actual segment. We will also see further peculiar characteristics of floating segments in Coeur d'Alene.

Cole(1987) notes that there is another way to explain Chaha Labialization and Palatalization rules without invoking a multi-planar representation. Suppose that it is possible to explain this phenomenon with a uni-planar representation. This assumption itself acknowledges that Plane Conflation is not a Bracket Erasure since rules (24) are clearly morphological rules which require that triggers and targets are certain morphemes.

Let us consider some languages examined by Cole (1987) where morphological feature spreading allegedly takes place prior to Plane Conflation, thus with a multi-plane representation; Coeur d'Alene, Mixtec, Walpiri, and Wiyot. Regressive [+round] feature harmony in Walpiri can be also explained with a uni-planar representation as Cole notes. In Coeur d'Alene and Mixtec, a floating feature is a harmony trigger. In Wiyot, Cole suggests that either a floating feature or a feature of the existing morpheme triggers harmony. Here we will examine Coeur d'Alene and Wiyot.

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In Coeur d'Alene, a diminutive morpheme is realized by glottalizing all the sonorants in its domain (with an optional gemination of the initial consonant). However, inherent glottalized consonants do not block the spreading of a glottalized feature to the sonorants as we see in (28).

(28) yap'-yEp'-ic   ---->   y'ap'-y'Ep'-m'En'-tsut
      'rocker'   'he rocked, used himself to sway
                              repeatedly'

Cole explains this with a multi-planar representation -- since diminutive glottalization is a different morpheme than the glottalization underlyingly present to the glottalized consonant [p'], no blocking effect is observed as we see in (29) (cf. McCarthy 1987). Note again that the trigger is a floating segment which never surfaces by itelf.

(29)

$$[cg] \qquad \text{affixal plane}$$

y'ap'-y'Ep'-m'En'-tsut

$$[cg] \quad [cg] \qquad \text{base}$$

Cole (1988) shows that a diminutive formation in Wiyot is another case where a feature spreading should take place with a multi-plane representation. The diminutive forms in Wiyot are expressed either by the consonant alternations in (30a) with the optional presence of a diminutive suffix /ats/ or by the consonant alternations in (30b) and with the presence of a diminutive suffix /atš/.

(30) a.   t ----> ts   d --> dz
           tš ----> ts   (dj --> dz/ts)
           s ---> š   l ---> r
suffix: no overt diminutive suffix in some cases
       /ats/ in other cases
      b.   t ---> tš   d ----->dj
           ts --> tš   (dz --> dj)
           s ----> š   l----->r
suffix: /atš/

Cole argues that [+cont,αant] feature of the diminutive morpheme in Wiyot spreads to the other coronals in its domain. However, this spreading should take place with a multi-plane representation since a coronal [s] does not participate in this feature spreading as we see in (31). Rather it is dissimilated to an alveo-palatal [š] in this domain by rule (33).

(31) anterior

coronal

X X X X X   X X X X X   X X X X
d a l a d - a t a s   a l a
[+cont]

*violation of association line crossing constraint

(32) anterior

coronal

X X X X X   X X X X X   X X X
d a l a d - a t a s   a l a

anterior

+
[+cont]

(33) a. S-Dissimilation

$$[\text{+ant}] \longrightarrow [\text{-ant}] \ / \ \underline{\quad} \begin{array}{c} \text{|} \\ \text{coronal} \\ \text{|} \\ \text{root} .... \\ \text{|} \\ [\text{+con}] \end{array} \left| \begin{array}{c} [\text{+ant}] \\ \text{|} \\ \text{coronal} \\ \text{|} \\ \text{root} \\ \text{|} \\ [\text{cont}] \end{array} \right.$$

diminutive

b. bas-ats -----> baš-a:ts

Note that S-dissimilation (33) takes place with a multi-plane representation and it is formulated to apply to both diminutive allomorphs, /-ats/ and the segmentless version, alike.

Cole notes that given the adjacency condition on morphologically governed rules she proposes, it would not be possible to formulate a morphologically governed dissimilation rule that affected an /s/ appearing anywhere in a stem. Thus if another coronal were to occur between an /s/ and the diminutive suffix, then /s/ is not adjacent to the trigger of dissimilation on the coronal plane, and therefore cannot undergo the dissimilation rule (33a).

The prediction would be following: only the final coronal /s/ would undergo the rule. If /s/ appears as a non-final coronal, it would not undergo the rule. Cole notes that the data in this regard is extremely limited. In all of the examples of words containing /s/ that undergo diminutive consonant shifts, /s/ is the final coronal as we see in (33b).

Two questions arise. The first question is the following: one characteristic of consonant symbolism, as Cole notes, is the exceptionless nature of the alternations. Then, why does an alveolar /s/ to an alveo-palatal continuant /š/ mutation in Wiyot have to be so limited in its application? Though no convincing data might be available, isn't it

more likely that any /s/ in the diminutive formation will be changed to an alveo-palatal continuant /š/?

The second question with rule (33) is the following: Note that there is no skeletal slot adjacency between the target [s] and the trigger: any non-coronal consonants and vowels can intervened. Also note that there is no adjacency of coronal nodes of the trigger and the target either since relevant coronal nodes are on different planes.

Since the two coronal segments are on different planes, perhaps we are referring to the 1st coronal node before a morpheme boundary. The dissimilation rule is applied to the [+ant] feature of [s] when there is a [+ant] feature on a different plane. If this is how the rule works, however, there will be no difference between rule (33) on the one hand and rules (27a) and (27b) on the other hand: in (33), it is the deletion of the structure (A&P, 1986) and in (27a) and (27b), it is the insertion of the structure in a similar environment.

(27a) a [+rnd]   (27b) [+rnd]

```
       ä         [+rnd]            [+rnd]
      / \    ⌐¬                        ⌐¬
 C V C V G + V       C V C V C + V
 |   |⌐ ¬|           | |  |⌐¬| |
 n   k   s           n  ä k  ä s
   [näkwäsu]          [näkwäsu]
```
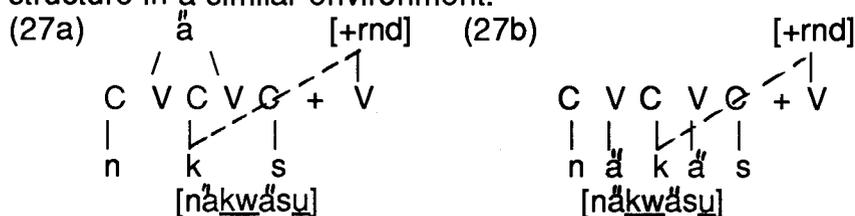
In (27a) and (27b), the [+rnd] feature of the suffix spreads to the final velar of the morpheme boundary, the prediction is that this rule should be allowed by principle.

Cole mentions some characteristics of morphologically induced rules in English, Malayalam and Ci-Ruri: that is, morphologically induced rules affect the segments which are adjacent to the boundary. However, there seems to be a difference between a rule (33) and the other rules. In none of the other rules, does any feature of an actual affix provides a phonological environment for a rule to apply. However, a diminutive affix in rule (33) specifically provides an environment for a phonological rule. I am more inclined to reject this kind of phonological rule even in the lexical stratum.

Let us examine the following alternative: some words in Wiyot take no suffix in diminutive formation whereas others take /at/ as a part of diminutive formation. The diminutives formation in Wiyot is given in (34). Again, we posit floating features for the trigger of the alternations.

(34) diminutive formation in Wiyot

some words → floating [+cont, +ant] (Target: [-cont, +cor, -son])
                floating [-ant] (Target: /s, l/)
another words → floating [+cont, +ant] + suffix /at/
              (/at/ will surface as [-ats] by [+cont, +ant] spreading)
                floating [-ant] (Target: /s, l/)

other words -->   floating [+cont, -ant] + suffix /at/
              (/at/ will surface as [-atš] by [+cont, -ant] spreading)
              floating [-ant] (Target: /s, l/)

        Though the following rule was rejected by Cole, we can also formulate consonant mutation rules as (30) which seem to me to have their own advantages.

(35)   a.   C---> C /   [   ]
             input   output   diminutive

        It seems to me that there is not much evidence which shows that every morphological rule should take place with a multi-plane representation. Many rules that Cole (1987) has suggested have the stigma of being triggered by a floating segment which never surfaces: With the minimal assumption that a feature-sized floating segment may not be aligned with other existing melodies, the non-blocking effect of the multi-planar representation can be equally achieved.

IV. Conclusion

        In this paper, we have tried to show that there are not so many context sensitive phonological rules which should take place with a multi-plane representation. To find out when Plane Conflation takes place, we have to try to vary the point of Plane Conflation as much as possible. If we can find the definable point and the side-effect of Plane Conflation at that point gives us the benefit of the locality condition of the phonological rules, we have to choose that point for Plane Conflation over the last point of Lexical Phonology. If we find worse consequences by changing the point of Plane Conflation, then we have good reasons to put the PC as the last rule of lexical phonology. It appears then that to find out the point of PC, we have to move two directions: from the top to the bottom and from the bottom to the top.

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