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Eliminating Destressing Rules

0. Summary

A growing amount of attention is being paid to the question whether it is possible to eliminate destressing rules (Kager 1989, de Haas 1989). In this article I argue that destressing follows from the very representation of stress. The article is structured in the following way; in the first section I develop the apparatus that can account for destressing effects. In the second section I demonstrate how this works. In the third section I try to make precise what the differences are between the theory proposed here and the only well developed alternative that is available, Kager (1989) and an improved version thereof, vz. de Haas (1989).

1. The stress plane

In Kager (1989) it is claimed that feet always contain no more and no less than two syllables. To some extent I follow the essence of Kager's hypothesis, but I deny that this so called 'binary branchingness' of feet is universal. In some languages feet may contain more than just two syllables, in which case the language has unbounded feet. Feet can also contain less than two syllables in some languages. In Hermans (forthcoming) it is proposed that the obligatory presence of two syllables in the domain of a foot is required by a specific feature specified on that foot and constraining its geometrical structure in the appropriate way. We might call this feature [OB], where OB means 'obligatory branching'. A constituent specified with this feature must branch. Hermans proposes that the feature [OB] is always relevant for a specific node of the foot; it may constrain 1) its top node, in which case we generate a foot that minimally contains two syllables, or 2) it may constrain the head of the foot, in which case the foot must dominate a heavy syllable in a strong position, or 3) it constrains either the top node or the node in strong position, but not both. The three varieties of [OB] can respectively be represented as [OBm] (top node version), [OBh] (head version) and [OB<h,m>] (either top node or head version). Although this feature is relevant for bounded as well as unbounded feet, we are solely concerned with the bounded feet in this article. Below I demonstrate how the three manifestions of the feature [OB] determine the geometrical shape of bounded feet (heavy syllables are marked as /\; light syllables as |; heaviness is only indicated in those cases where it is relevant).

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```
(1)    a                     [OBm]
  well formed                                  ill formed

    /\                                           |
   /  \                                          |
   o  o                                          o

       b                     [OBh]

    /\      |                                    |      /\
   /  \     |                                    |     /  \
   o  o     o                                    o     o  o
  / \      / \                                   |     |

       c                     [OB<h,m>]

    /\      |                                    |      /\
   /  \     |                                    |     /  \
   o  o     o                                    o     o  o
   |       / \                                   |    / \

       d                     unspecified for [OB]

    /\      |
   /  \     |
   o  o     o
```

As shown in (1), four types of bounded feet can be distinguished. Firstly, bounded feet which must dominate two syllables. These feet have the schematic structure of (1a). Secondly, as shown in (1b), feet exist that are only well formed if the syllable in dominant position is heavy. Thirdly, there is a mutual interdependence between the number of syllables of the foot and the dominant syllable; if the foot is bisyllabic, the head may not be heavy and conversely, if the head branches, the foot as a whole consists of maximally one syllable. However, at some level of the foot branchingness must be realized. Examples of well formed, resp. ill formed representations are given in (1c). Finally, in some languages no branchingness requirement is imposed on feet. When that happens a foot can be monosyllabic (cf. (1d)).

Hermans (forthcoming) claims that metrical constituents are structured according to the laws of X'-theory. A foot, for instance, is viewed as a maximal projection, called F', which has an F0 head. In this theory, the outlines of a left dominant foot look as follows:

```
(2)            F'
              / \
             /   \
            /     \
          F0       o
         /|\      /|\
        X X X    X X X
```

Two syllables, one of which is labeled F0, are dominated by F'. By this very fact this constituent is a projection of F0 (the head). The left dominant character of the foot is recoverable from the fact that this head occupies the leftmost position. Hermans shows that by makig use of X'-theory it becomes possible to introduce the concept of government into phonology. Slightly simplifying, we can say that a head governs all constituents in its projection, except the constituents it dominates.

Following essentially Halle and Vergnaud (1987), Hermans also argues that every constituent corresponds to an element on the grid, which is called the 'stress plane'. The fact that every constituent is 'projected' on the stress plane is claimed to be a consequence of a fundamental principle of phonology, the 'X-Condition', which says that every feature must be linked to the X-line. A feature can satisfy the X-Condition in one of two ways: it can be linked to an X-slot by one or more association lines, or it can be coindexed with an identical feature which satisfies the X-Condition. The lines of metrical constituents are not association lines. Hence, the features of these constituents can only satisfy the X-Condition by being coindexed with an identical feature on the stress plane, because these features are linked to the X-line by true association lines. The relation between the features of metrical constituents and the features on the stress plane is constrained by the following condition:

(3) Condition on Supporting Elements (CSE)

α may only be coindexed with β iff there is a path P from α to β such that P exlusively consists of positions that are not governed by γ, where γ is categorially identical to α.

The X-Condition and the CSE change the structure of (2) as follows:

(4)
```
         F'i
         / \
        /   \
       /     \
      F0i     o
     /|\     /|\
    X X X   X X X
     \|/
     *F0i
```

In this representation the features of the foot are sound, because they are coindexed with a feature that is linked to the X-line. Furthermore, the relation of coindexation is well formed because it satisfies the CSE. Notice that the CSE disallows the supporting features to be linked to the X-slots of the second syllable, because this syllable is governed by the head of the foot. Since the supporting feature on the stress plane is categorially identical to the head of the foot, it may not be linked to X-slots that are governed by the head of the foot. I will now try to show how the apparatus developed in this section eliminates destressing rules.

2. Foot Intrusion

Suppose we construct left dominant [OBm] bounded feet from right to left in a domain with an odd number of syllables. What happens with the syllable on the left edge? No monosyllabic foot can be constructed because [OBm] requires that feet specified with this feature branch at the level of the maximal projection. I claim that one of two things can happen. Firstly, construction of the leftmost foot is blocked; secondly, the initial foot intrudes into the domain of the second. Languages are parametrized in this respect. Below I illustrate the two outcomes. (In order not to blur the picture I have simplified the representations).

```
(5)          intrusion                     no intrusion
            F'.. F'..  F',OBm                  F'..  F',OBm
           /\   /\    /\                       /\    /\
          / \ /  \  /  \                      / \  /  \
          o   o   o  o  o               o    o   o  o  o
          *FO *FO    *FO,OBm                 *FO    *FO,OBm
```

Consider first the righthand configuration arising in a language that does not allow intrusion. Since no foot is generated over the first two syllables, the initial syllable does not receive stress. Consequently, we do not need to postulate a destressing rule to remove the stress of the initial syllable. Some data of Warao, taken from Hayes (1981:51), can clarify this point.

(6)	yàpurùkitàneháse	'verily to climb'
	yiwàranáe	'he finished it'
	enàhoròahàkutái	'the one who caused him to eat'

The last two examples show that the initial syllable is not stressed if the word contains an odd number of syllables. It is important to understand that not all languages behave like Warao. In Maranungku, for instance, the 'left over' syllables do get stress. The following data illustrating this point are also taken from Hayes (1981:51).

(7)	mérepèt	'beard'
	lángkaràteti	'prawn'
	wélepènemànta	'kind of duck'

In this language left dominant feet are constructed from left to right. In words with an odd number of syllables the left over syllable is stressed. In our system we say that the feet of Maranungku are unspecified for [OBm] (cf. (1d)).

What happens in languages that allow one constituent to intrude into the domain of another? We want to say that the lefthand representation in (5) is ill formed because no syllable should be dominated by more than one foot. In our framework it is the CSE that can explain why this configuration is ill formed. The second syllable is governed by the head of the initial foot because it is dominated by this foot. Consequently, the path from the element on the stress plane to F' contains a governed node. This node is governed by a constituent of the same category as the supporting element on the stress plane. Since this is ruled out by the CSE, the element on the stress plane cannot be coindexed with the second foot. Therefore, the second foot violates the X-Condition; its features are not linked to the X-line. Since it is ill formed, it is removed. Notice that in our example only the second foot is ill formed; the initial foot is fine with respect to the CSE. The output of correction therefore is as follows:

```
(8)          F'..        F',OBm
            /\          /\
           /  \        /  \
           o   o   o   o   o
           *F0..       *F0,OBm
```

This representation does satisfy the CSE. It therefore also satisfies the X-Condition.

We thus see that in a language where left dominant, obligatory branching feet are constructed from right to left, the 'rhythmic train' can be interrupted on the left edge in words with an odd number of syllables. More specifically, the initial syllable is stressed and also the fourth syllable from the left. No destressing rule needs to be postulated to describe these facts. A good example of a language with representations similar to (8) is Garawa. For this system Hayes proposes the following set of rules (Hayes 1981:54):

(9)
- a) Assign a binary, quantity insensitive, left dominant foot at the left edge of the word.
- b) Group the remaining syllables of the word into similar feet, going from right to left.
- c) Form a left dominant word tree. Remove non-branching feet in weak position.

In our system the first rule can be dispensed with. Also, the second part of the third rule is superfluous. Both facts are explained by two hypotheses: 1) Garawa allows intrusion and 2) feet are obligatory branching at the level of the maximal projection. In passing I would like to note that the first foot becomes the head of a higher level constituent. In this way we can account for the fact that the stress of the first foot becomes the main stress of the word.

Also in English feet are assigned from right to left. These feet are [OB<h,m>]. In addition to that, they are quantity sensitive, which means that the syllable in weak position may not be heavy. Now consider the following array of facts (taken from Hayes (1981):

(10) a	Wìnnepesáukee	b	Tìcònderóga	c	Monòngahéla
	àbacadábra		òmpòmpanóosuc		Atàscadéro

The forms in (10a) show that the first foot intrudes into the domain of the second, which is deleted. This derives the effects of Poststress Destressing (cf. (10a)). In the forms in (10b) and (10c) the second syllable is heavy. Since in English feet are quantity sensitive, it may not occupy the weak position of a foot. Hence, either a monosyllabic foot with a heavy head is constructed, or no foot is constructed at all. In the forms in (10b) the initial syllable is heavy. Therefore, it is possible to construct a foot that satisfies the feature [OB<h,m>] (cf. (1c)). In the forms in (10c), however, the initial syllable, is light. Therefore, in these cases no foot can be constructed. The facts of (10b) and (10c) illustrate the traditional rule of Prestress Destressing. No such rule needs to be postulated in our framework.

So far we have only considered cases where left dominant feet are constructed from right to left. We have seen that in these cases the newly constructed foot, the foot which is the intruder, has the effect of eliminating its older neighbor, i.e. the foot that has been constructed by a previous application of the construction rule. Now consider a case where left dominant feet are constructed from left to right. Our theory predicts that now it is the intruder that is deleted. This is demonstrated below:

```
(11)        F'..    F'.. F',OBm
           /\      /\   /\
          /  \    /  \ /  \
          o   o   o   o   o
          *F..    *F. *F0,OBm
           -------------->
```

In this configuration the medial foot satisfies the CSE. Only the foot on the right edge, i.e. the foot that intrudes into its neighbor is ill formed. Therefore, the new foot is deleted. We thus derive the following structure:

```
(12)        F'..    F',OBm
           /\      /\
          /  \    /  \
          o   o   o   o   o
          *F..    *F0,OBm
```

Combining this with the idea that in some languages intrusion of one constituent into the domain of another is not allowed, we derive the following predictions:

(13) a) LD feet constructed from R-->L;
1) the initial foot is not constructed (intrusion is not allowed), or:
2) the second foot is deleted (intrusion is allowed);

b) LD feet constructed from L-->R;
1) the final foot is not constructed (intrusion is not allowed), or:
2) the final foot is deleted (intrusion is allowed).

We now see that there is a surface contrast between blocking of the new foot and foot deletion only in those systems where left dominant feet are constructed from right to left. In systems where left dominant feet are constructed from left to right blocking of the new foot and foot deletion lead to identical results at the surface. We know already that Warao is an instance of the first case of (13a). Garawa and English instantiate the second case of (13a). This indeed shows that a contrast is attested where we expect it.

I would like to claim that Cairene Arabic has a left dominant, bounded and quantity sensitive foot. This foot is specified as [OB<h,m>]. In those cases where no left dominant foot can be constructed, a right dominant foot is build, which is unspecified for OB. The final foot receives main stress, at least if it branches. If it does not branch, the prefinal foot becomes the head of the word tree. The final segment is extrametrical on the precondition that it is dominated by a branching nucleus. Finally, and most importantly, the feet are constructed from left to right. Now consider the following forms (taken from Hayes 1981:115-116).

(14)	a	buxala	'misers'
	b	?amalti	'you (f. sg. did'
	c	muxtalifa	'different (f. sg.)'
	d	martaba	'mattress'
	e	s'ajaratahumaa	'their (dual) tree (nom.)'

The form buxala receives two feet. The initial foot branches. Since its dominant syllable is not heavy, it must be bisyllabic. In buxala this requirement is met. Exactly the same foot is constructed at the right periphery. We thus derive the following foot structure:

```
(15)      F'. F',LD..
         /\  /\
        /  \/  \
       bu  xa la
        *FO *FO,LD..
```

We now predict that the newly constructed foot is removed, contrary to what happens in English where the previously constructed foot is subject to deletion. Now consider a form with an even number of syllables, like s'ajaratahumaa. In this form no conflict between the last two feet arises:

```
(16)       F'..  F'..  F',LD..
          /\    /\    /\
         /  \  /  \  /  \
       s'a ja ra ta hu ma{a}
         *FO.. *FO.. *FO,LD..
```

The final foot becomes the head of the word tree because it branches. Hence, we derive penult stress in this case.

The subsystem of Cairene Arabic we have dealt with so far is a good example of the type of system given in (13b). Our theory of destressing now predicts that in similar systems no surface contrast is to be found of the type given in (13a). We do not expect to find a language like Cairene Arabic, with left dominant feet constructed from left to right, where in words with an odd number of syllables the penult foot is deleted. To the best of my knowledge this is true; no such language has ever been attested. This is an argument in favor of our theory of destressing.

The picture of Cairence Arabic sketched so far is blurred by the heavy syllables. For the sake of completeness we have to go through the remaining facts given in (14). The form muxtalifa has antepenult rather than penult stress, although it has an even number of syllables. In our analysis this is explained by the fact that a monosyllabic foot is build over the first syllable. This foot must be monosyllabic because it branches at the level of its head. Hence, at the level of the maximal projection it may not branch. To the right of the monosyllabic foot a branching, left dominant foot is constructed. This is possible, because, apart from the maximal projection, no other (relevant) node branches. To the right of this branching foot a new branching foot is constructed. This however, must be removed again in a way similar to what happens in buxala.

The form martaba has penult stress, although it has an uneven number of syllables. This form receives the following analysis. Over the initial syllable a monosyllabic foot must be constructed. To the right of this foot a branching, left dominant foot is build. This foot may branch because no other relevant node branches. Since the final foot branches, it becomes the head of the higher level constituent, thus deriving penult stress.

The form ?amalti is special in that the initial foot must be right dominant. This is a consequence of the fact that the second syllable is heavy and the initial light. Due to the former fact the foot may not become bisyllabic; due to the latter fact, however, it must be bisyllabic. From this it follows that no left dominant foot can be build. When that happens a right dominant foot can be constructed. The next foot must also be right dominant because no well formed left dominant foot can be build, which is a consequence of the fact that the second syllable is heavy. No special branchingness requirements are imposed on the right dominant foot. Therefore, it is allowed to be monosyllabic. Since it does not branch, the penult foot becomes the head of the word tree.

Summarizing: I have claimed that constituents are accompanied by an element on the stress plane. The position of the stress plane element is accounted for by he CSE. I furthermore have claimed that, when it is combined with the feature [OB], this apparatus can eliminate destressing rules. This theory makes a prediction concerning deletion sites. In languages with left dominant feet constructed from right to left, construction of the initial foot is either blocked (Warao), or the second foot from the left is deleted (English and Garawa). No such surface contrast, however, should be possible among the languages with left dominant feet constructed from left to right. In these languages only the newly constructed foot can be deleted if a conflict between feet arises. This means that blocking and deletion of the new foot lead to identical results. An example of a language whith left dominant feet constructed from left to right is Cairence Arabic. Notice that, by implication, the same predictions are made with respect to the mirror image systems. In this article there is no room to investigate this additional hypothesis. Let us now compare our theory with the only well developed alternative, Kager (1989) and de Haas (1989).

3. Alternative proposals

In Kager (1989) it is tried to eliminate destressing rules by means of a constraint on branchingness, together with a principle called the 'Free Element Condition. Basically, this principle says that construction of one foot may not lead to a change of some other foot. When this is combined with the idea of obligatory branchingness, as is done by Kager, we can derive the effects of destressing rules. In the example yiwaranae (cf. 6)), for instance, the initial syllable can only be parsed into a foot if the second foot would become monosyllabic. This, however, is not allowed by the FEC. Therefore, no foot can be constructed over the initial syllable.

For this theory the English facts of (10a) are a major problem, because these forms are a counterexample to the FEC. This problem, however, has been solved in de Haas (1989). According to de Haas, left dominant (obligatory branching) feet are constructed from right to left in English. This is done non-iteratively. Subsequently, foot construction proceeds from left to right in iterative fashion. In de Haas' approach no violation of the FEC arises. This is shown below:

```
(17)   /\        /\
      /  \      /  \
      a ba ca da bra
      *        *
      ---->    <----
```

In this example no medial foot can be constructed, due to the FEC. I claim that this approach suffers from two drawbacks. The first has to do with the iterativity parameter. It has been shown by Halle and Vergnaud (1987) that the iterativity parameter can be derived from 'conflation', which is a process that removes all secondary accents in a given domain. The reverse, however, is not true; conflation cannot be derived from the iterativity parameter. This is demonstrated by languages like Russian and Sanskrit (Halle and Vergnaud 1987) and Serbo-Croatian (Hermans forthcoming). In these languages stress is assigned cyclically. Therefore, a series of stresses is generated, irrespective of iterative or non-iterative foot construction. All stresses but one are then deleted. Since conflation can do the work of the iterativity parameter and since, furthermore, conflation cannot be subsumed under the iterativity parameter, the latter should be eliminated in favor of the former. Consequently, all constituents are constructed iteratively as a matter of principle.

Notice that de Haas' analysis makes it impossible to eliminate the iterativity parameter, because it is crucially based on it. In our approach, however, this problem does not arise. In this alternative, feet are constructed iteratively. Foot deletion in cases like (10a) is a result of the CSE and the X-Condition, which are independently needed.

The second drawback concerns the fact that no prediction is made with respect to the deletion site. De Haas' proposal predicts that there could easily be a language like Cairene Arabic (with right dominant feet) where a foot is build over the final two syllables, so that the antepenult syllable does not receive a foot. I show this in (18).

```
(18)   /\       /\
      /  \     /  \
      o   o   o   o   o
          *           *
      ---->     <----
```

First, a right dominant foot is constructed on the right edge. Subsequently, feet are constructed from left to right. In our theory it is impossible to derive facts of the type given in (18). In this system feet are constructed iteratively by definition, because the iterativity parameter does not exist. Right to left construction of right dominant feet cannot account for the absence of stress on the third syllable. Left to right construction cannot account for the presence of stress on the final syllable. We thus see that our theory of stress deletion is more restrictive in this respect.

4. Conclusion

I have shown that it is possible to develop an alternative theory of destressing that follows from the very representation of stress. With respect to de Haas' proposal, which is a modified version of Kager (1989), there are two advantages: 1) the iterativity parameter can be dispensed with; 2) it predicts that there is an intimate relation between the direction of dominancy and the deletion site. No such prediction can be made in Kager's and de Haas' theory.

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