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On the Relationship of Rhythm to Destressing

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On the Relationship of Rhythm to Destressing*

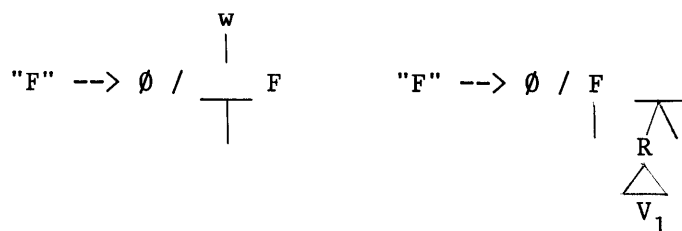
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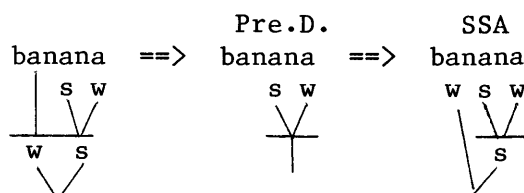
In this paper, we propose a new mechanism in metrical theory -- disassociation. This device allows us to collapse the rules of Prestress Destressing, Poststress Destressing, and Rhythmic Adjustment in English. Moreover, it allows us to dispense entirely with the rule of Stray Syllable Adjunction. In addition, we propose a new labelling convention for metrical trees that achieves certain desirable consequences. For example, we eliminate free branching in nonderived vocabulary, as proposed by Kiparsky (1979), and restrict nonderived word tree branching in English to right-branching structures. This allows us to account straightforwardly for the different applicability of the rhythm rule in examples like Ticonderoga and Apalachicola. Finally, the analysis makes certain empirical predictions -- differing from all other previous accounts -- that are borne out in the data.

The organization of the paper is as follows. First we consider the rules of Prestress Destressing and Poststress Destressing as they appear in Hayes (1981). This account misses certain generalizations that can be captured when these rules are collapsed. We then go on to consider the rhythm rule, arguing that it too can be collapsed in with the destressing rule. This new formulation leads us to revise the tree labelling mechanism.

Below we give the rules of Prestress and Poststress Destressing in English as formalized by Hayes.

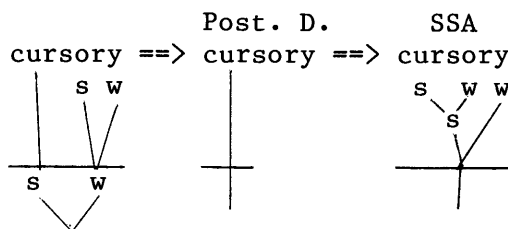


Prestress Destressing eliminates a monosyllabic foot in metrically weak position preceding another foot and dominating a light syllable. The footless syllable is then subject to Stray Syllable Adjunction (SSA) adjoining it as a weak sister to an adjacent foot. Here's an example.



The first tree is derived by Hayes' tree construction and labelling algorithms. The structure is then subject to the destressing component. The antepenult is defooted by Prestress Destressing and the footless syllable is adjoined as a weak sister to the following foot.

Poststress Destressing operates in much the same way. A bisyllabic foot is removed in metrically weak position following a monosyllabic foot, provided the first syllable of the bisyllabic foot is not closed by a consonant. The following derivation exemplifies this rule.



Poststress Destressing applies first. The footless syllables are then adjoined as weak sisters to the preceding stressed syllable by Stray Syllable Adjunction.

A careful comparison of Prestress and Poststress Destressing suggests that the two rules are actually instances of the same rule. Both rules perform the same structural change. They both remove a foot, leaving material to the operation of Stray Syllable Adjunction. If these are independent rules, then we might expect them to perform different operations, and to the extent that they

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do the same thing, one must suspect a violation of Occam's razor. Consider now the structural description of the two rules. In terms of the material outside the foot to be removed, both rules require an adjacent foot. The difference is that Poststress Destressing requires the adjacent foot be monosyllabic, while Prestress Destressing doesn't have this stipulation. We cannot relax this stipulation on Prestress Destressing to help collapse the two rules with mirror-image notation either. There are plenty of cases where one doesn't get destressing when the adjacent foot is a disyllable.

$\begin{array}{c} \diagup \quad \diagdown \\ \text{Abernathy} \\ \diagdown \quad \diagup \\ \text{Ladefoged} \\ \diagup \quad \diagdown \\ \text{orthodoxy} \end{array}$	$\begin{array}{c} \diagup \quad \diagdown \\ * \text{Abernathy} \\ \diagdown \quad \diagup \\ * \text{Ladefoged} \\ \diagup \quad \diagdown \\ * \text{orthodoxy} \end{array}$
--	--

One can't go the other route either -- that is, one can't try to show that Prestress Destressing really only occurs when the following foot is monosyllabic. Prestress Destressing occurs whether the following foot is monosyllabic or bisyllabic, as the following examples show.

$\begin{array}{c} \diagdown \quad \diagup \\ \text{balloon} \\ \diagup \quad \diagdown \\ \text{attack} \\ \diagdown \quad \diagup \\ \text{convince} \end{array}$	$\begin{array}{c} \diagdown \quad \diagup \\ \text{banana} \\ \diagup \quad \diagdown \\ \text{America} \\ \diagdown \quad \diagup \\ \text{contemplative} \end{array}$
--	---

Thus formulating the rule in terms of geometric properties of adjacent feet is probably a red herring. The generalization that covers both Prestress and Poststress Destressing is not the kind of foot the defooted foot is adjacent to, but rather the kind of syllable the defooted foot is adjacent to. The defooted foot must apparently be adjacent to a stressed syllable. Given that feet in English are trochaic, Prestress Destressing needn't stipulate what kind of foot the destressed syllable is adjacent to, since, whether that foot is branching or not, the destressed syllable will always be adjacent to a stressed syllable. Contrast this with the case of Poststress Destressing. To insure that a preceding syllable is stressed, one must require that that foot is monosyllabic. Thus an account of poststress destressing formulated in terms of feet must stipulate that a preceding foot be monosyllabic in order to capture the fact that destressing requires an immediately adjacent stressed syllable.

Let's now consider that part of the structural description of the rules that mentions material inside the foot to be removed. Prestress Destressing, in its formulation here, makes no stipulation about the foot to be destressed except that it be monosyllabic. Poststress Destressing stipulates that the foot to be destressed must be a disyllable, and the first syllable may contain a tense vowel. Let's consider these differences in manageable pieces: first, the geometry of the foot to be removed; and second, the syllable structure of the foot to be removed.

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One must maintain that Prestress Destressing only applies to monosyllabic feet, as there are many examples of bisyllabic feet in weak position before a following foot that do not undergo destressing.

Alabama còrrespond Anaconda	*Alabama *còrrespond *Anaconda
-----------------------------------	--------------------------------------

This restriction can be accounted for under an extension of the stressed syllable hypothesis sketched above. We said that a foot must be adjacent to a stressed syllable if it is to be destressed. Let us now extend this to say that the stressed syllable of a foot to be destressed must be adjacent to a stressed syllable in order for that foot to be defooted. This accounts for the failure of defooting in the cases above. They cannot undergo defooting because the stressed syllables are nonadjacent.

This, however, will not help us with the Poststress Destressing case. The stressed syllable of the foot to be defooted is adjacent to a stressed syllable whether or not the former is monosyllabic or bisyllabic. Nonetheless, Poststress destressing fails when the foot to be defooted is monosyllabic, as a comparison of the following columns shows.

Mentone Mèntor	Monotony (cf. Monotone) cursory (cf. promissory)
-------------------	---

Let us leave this restriction on Poststress Destressing for the moment. We will see that it actually ties in with the syllable weight restriction on that rule too.

As noted above, Prestress and Poststress Destressing also differ in that Poststress Destressing can apply to a tense vowel, while Prestress Destressing can apply only to lax vowels. The following examples show this contrast.

gradation vocation donation	degradation provocation intonation
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In prestress position, tense vowels don't destress, but in poststress position, they do.

To account for this difference between the two rules, we propose the following rule.

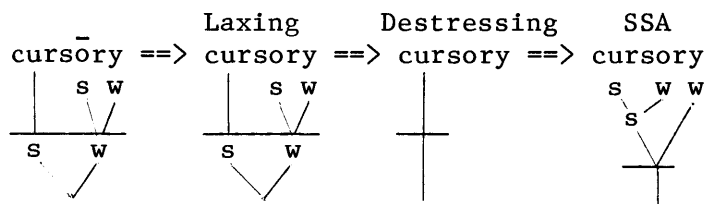
$$V \rightarrow [-tns] / \sigma _ \sigma$$

This rule laxes a vowel between two syllables and feeds Poststress Destressing. It allows us to factor the two remaining differences

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between Prestress and Poststress Destressing out of the Poststress Destressing rule. One difference between the two rules is that Poststress Destressing applies only to binary feet. This is now seen as a condition on the laxing rule -- not on the destressing rule. Poststress Destressing now only applies to lax open syllables. Thus the only way it could apply to a tense vowel is if that vowel laxes by the Laxing rule. This effectively guarantees that the foot to be destressed is bisyllabic.

Second, we need no longer allow Poststress Destressing to apply to tense vowels, but Prestress Destressing not to. The stress system conspires such that Prestress Destressing only needs to apply in initial position, thus excluding those syllables from application of the Laxing rule. We will see below that this rule requires some modification. Thus the reason Prestress Destressing doesn't apply to tense vowels is because Laxing can't apply in initial position.



This derivation exemplifies the application of the Laxing rule. Notice that we must further exclude the rule from applying to syllables with main stress.

maniacal
palatial
palomino

In addition, it can only apply when the preceding syllable bears some stress. Thus it doesn't apply in the following cases.

promissory
Ladefoged

We thus arrive at the following rule.

$$V \rightarrow [-tns] / \overset{s}{\sigma} _ \sigma$$

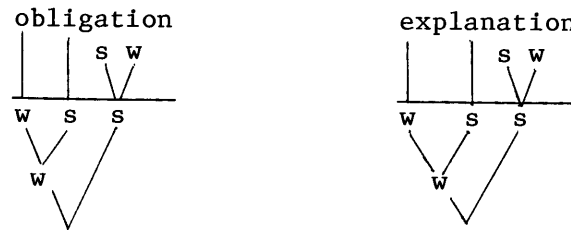
Condition: V cannot be the DTE of the word.

Given the complexity of this rule, one might suspect that it is just an ad hoc attempt to collapse the destressing rules. Two considerations militate against this view though. First, Laxing must apply to cases of Prestress Destressing too.

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$\begin{array}{l} \text{explain} \\ \text{oblige} \end{array}$
 $\begin{array}{l} \text{explanation} \\ \text{obligation} \end{array}$

Here the destressed syllable must undergo Laxing prior to destressing, but must undergo Prestress Destressing rather than Poststress Destressing, because the foot to be destressed is monosyllabic.



Second², Laxing is probably a lexical rule and Destressing postlexical². Laxing is subject to lexical exceptions and does not apply in nonderived vocabulary.

$\begin{array}{l} \text{invocation} \\ \text{denotation} \\ \text{emotivity} \end{array}$
 $\begin{array}{l} \text{Hoboken} \\ \text{Beethoven} \\ \text{Carmichael} \end{array}$

On the other hand, Destressing has no exceptions when it applies to light syllables. These properties are the hallmarks of these classes of rules, and argue that Laxing and Destressing should be split up³. We thus arrive at the following formulations for Prestress and Poststress Destressing.

$"F" \rightarrow \emptyset / \begin{array}{c} | \\ \text{s} \quad \text{w} \\ \hline \text{s} \\ \sigma \end{array}$
 $"F" \rightarrow \emptyset / \begin{array}{c} | \\ \text{w} \quad \text{s} \\ \hline \text{s} \\ \sigma \end{array}$

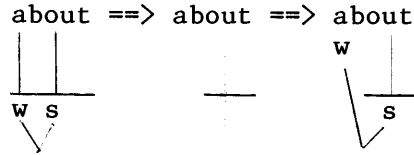
These formulations are trivially abbreviable using mirror-image notation⁴.

$"F" \rightarrow \emptyset \% \begin{array}{c} | \\ \text{s} \quad \text{w} \\ \hline \text{s} \\ \sigma \end{array}$

This abbreviation was made possible by factoring out the Laxing rule, and by reformulating the rule in terms of adjacent stressed syllables rather than geometry of adjacent feet. This reanalysis is in keeping with recent work on foot-domain rules. I have argued elsewhere (Hammond, 1982) that such rules are best formulated in terms of stressed syllables rather than foot geometry⁵.

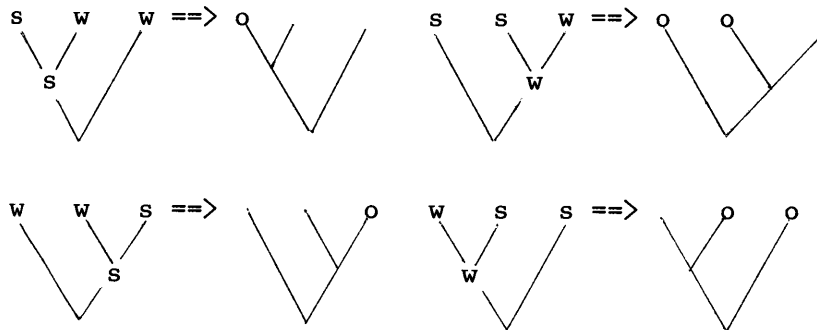
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Notice that certain inaccuracies remain in the formulation. Thus monosyllabic feet can trigger destressing even though the DTE of such a foot is not dominated by an 's' node.

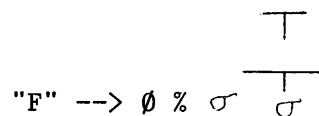


The proper notion here seems to be DTE, not 'strong' node. In the present theory, DTE is a derivative notion, calculable from 'strong - weak' labelling -- but a notion without theoretical consequences. However, the proper formulation of the English Destressing rule seems to require direct access to DTE-status. To handle this, we will assume, contrary to current assumptions, that DTE status is the core concept, and that 'strong-weak' labelling is the derivative notion. That is, trees are labelled for their DTEs, from which 'strong-weak' labelling may be derived.

In unmarked trees -- trees where weak nodes do not dominate nonterminal material -- DTE translates directly as terminal strong node. But in a marked tree -- where a weak node dominates nonterminal material -- DTE cannot translate as terminal strong node. The reason for this is that there is more than one terminal strong node in a marked tree. Two options present themselves here. We could only mark the true DTE, or we could mark all terminal strong nodes, and DTEs of categories with only one constituent. We will choose the latter option here, noting that we are therefore making DTE a derivative notion again. In a tree with more than one "DTE" marked, the true DTE is the least embedded one. Thus the trees below will have the labelling given⁰.



This allows us to reformulate the destressing rule as follows.



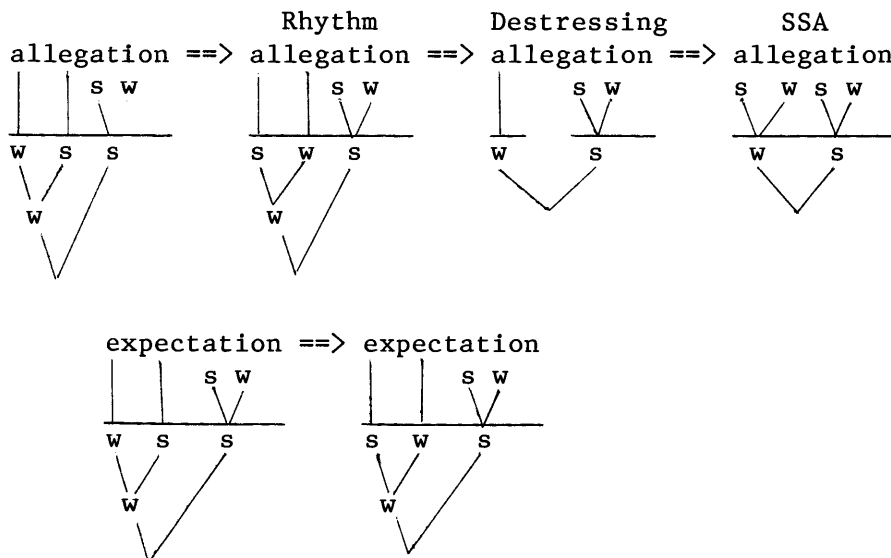
What this says is that a foot deletes when it contains a DTE adjacent to another DTE, and is not itself a DTE (of the word).

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Consider now the Rhythm rule in English. It accounts for alternations like the following. We limit ourselves here to word internal applications of the rule.

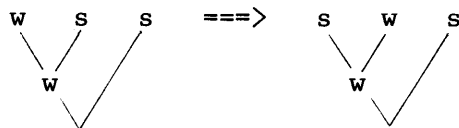
˘ expect	˘ expectation
˘ allége	˘ allegation
˘ déport	˘ déportation
˘ próvoke	˘ provocation

Ignoring for the moment cases like artificial - artificiality, we find that there are two kinds of Rhythm. One kind of rhythm retracts stress off a medial syllable leaving that syllable with a reduced degree of stress. The other kind of rhythm leaves an unstressed syllable. The difference between the two cases is conditioned by the weight of the syllable from which stress is retracted. The standard account is to have a single rhythm rule feeding a destressing rule sensitive to syllable weight.



Rhythm applies in both cases, but destressing only in the first, because the medial syllable in the second is heavy -- staving off destressing.

Consider the formulation of the rhythm rule. Liberman & Prince formulate the structural description of the rule in terms of the grid -- rhythm applies when it would relieve a clash. The structural change is as follows.



Consider now the structural change of the rule⁸. Kiparsky (1979) argues that the structural description of the rule is just the

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input tree to the structural change. Assuming this proposal to be well-motivated, we find that this structural description looks very much like the input to destressing. Both Rhythm and destressing apply adjacent to a DTE. Thus we observe effects for the rhythm rule analogous to the adjacency effects for destressing.

Consider the following words which contrast with the destressing examples above.

\iconoclast \sensational \anticipate	\iconoclastic \sensationality \anticipation
--	---

When the stresses aren't adjacent, Rhythm does not occur. These facts are accounted for though if we can collapse Rhythm and Destressing attributing to Rhythm the same conditioning factor of an adjacent DTE.

The first problem to be faced with this attempt is the applicability of Rhythm without subsequent destressing (expectation, etc.). If rhythm and destressing are the same, then we would expect destressing to behave the same way -- we would expect destressing to effect a reduction of stress in a heavy syllable without the reduction that occurs in light syllables.

In fact, this is apparently the case. For pairs like the following, Kenyon & Knott consistently record the secondaries in the second column as weaker than those in the first.

\California \Omicron \canneloni	\Calhoon \macron \cantankerous
---------------------------------------	--------------------------------------

The secondaries in the first column are represented as having secondary stress in Kenyon & Knott, while the secondaries in the second column are marked as unstressed unreduced. These facts extend to the cases of rhythm mentioned above. That is, the syllables from which stress is retracted are represented in Kenyon & Knott as being unstressed unreduced, unless they are light, hence undergoing reduction, and being classed as unstressed reduced.

These facts suggest a new division of labor that collapses rhythm with the destressing rule above. Rather than a rhythm rule feeding several destressing rules, one wants a rhythm/destressing rule that feeds a reduction rule. This would enable one to account for the destressing/reduction effect that is common to rhythm and destressing, and separate it from the vowel reduction rule which extends beyond rhythm and destressing, since one gets reduction in syllables that have never undergone rhythm or destressing, e. g. tempest, lieutenant, etc.

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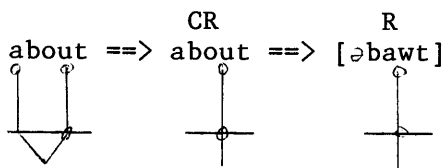
However, we are faced with a formal dilemma. How does one represent destressing without reduction within the strictly relational metrical theory of stress? We must be able to distinguish three cases: secondary stress (as in Càlifornia); unstressed unreduced (as in Càlhoón); and unstressed reduced (as in cāvört). The third case is easily enough distinguishable in terms of altered segmental content of the syllable concerned. Reduced vowels can be distinguished from the other cases because of a different vowel quality or shorter duration. The first two cases require something special to distinguish them. Rather than invent some diacritic, let us attempt to make as much use as possible of existing devices to mark these syllables.

As it stands, the theory signals destressing by removing a foot from the tree, and then rejoining the footless material to the tree. Let's assume that, instead of removing the foot node and rejoining the syllabic material to the tree, the syllable nodes dominated by the foot are pruned from the tree, forcing the foot to delete. The syllables are not rejoined to the tree by stray syllable adjunction. Rather, they are left unmoored, and interpreted as unstressed and unreduced, unless they are light and thus subject to the reduction rules.

This latter account has all the properties desired. Rhythm and Destressing are united in one rule. Vowel reduction is separated from destressing. No new devices are required. Finally, we get the bonus of eliminating altogether the rule of stray syllable adjunction. Below we give the new analysis some content.

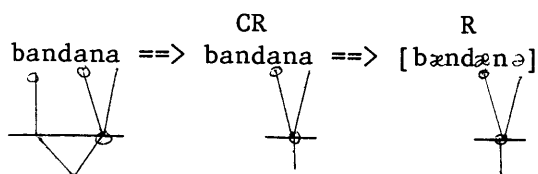
1. Clash Resolution: Prune from the word tree any syllables dominated by a foot where the DTE of that foot is adjacent to the DTE of the foot that's the DTE of the word tree.
2. Reduction: Reduce all nonDTEs and light DTEs pruned from the word tree.

Consider the following derivation.

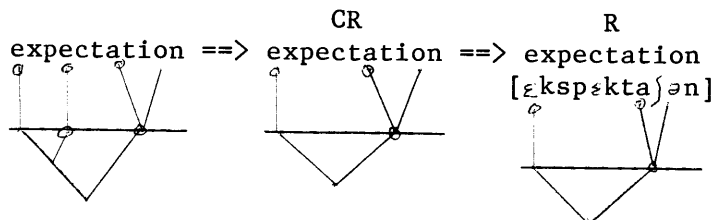


Here, Clash Resolution applies feeding Reduction, because the foot pruned is light. Compare the following case.

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Here, R can't apply to the antepenult because it's heavy -- it can only apply to the ultima because it's not a DTE.



Here we must say something different. We must somehow guarantee that the foot pruned is the medial one, and not the initial one. There are a variety of plausible algorithms to handle this case, but we will adopt the following one. CR applies in a hierarchical fashion. First it applies to resolve a clash involving the true DTE of a domain (where domain = word, phrase, etc.); then it goes on to resolve clashes involving any DTE; finally it resolves clashes not involving a DTE. This covers the following three cases.

- | | | |
|-------------|----------------|----------------|
| expectation | iconoclastic | Ticonderoga |
| allegation | anticipation | Srirangapatnam |
| bandana | sensationality | dodecanesian |

When the clash involves a true DTE, the other node is the node pruned. If a clash involves no true DTE, then only a nonDTE may be pruned. This gives us the right results for: expectation and iconoclastic, but gives us no prediction for cases like Ticonderoga. Here one might expect either syllable to get pruned. In fact, that's what one observes in most cases. We seem to get free variation.

When one of the syllables would then be eligible for reduction though, a curious thing happens: there is no alternation. If one syllable is heavy, it stays stressed, and its clashmate destresses, but if both syllables are light and thus eligible for reduction, there is also no alternation, but there is also no way to predict which syllable undergoes reduction -- both cases are attested.

- | | |
|---------------|----------------|
| Ticonderoga | Ticonderoga |
| Dōdecānēsian | Dōdecānēsian |
| Winnepesāukee | *Winnēpesāukee |
| Kālamazōo | *Kālamazōo |
| *Epaminōdes | Epaminōdes |
| *Apotheosis | Apotheosis |

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Coriolanus *Coriolanus
 *Monongahela Monongahela

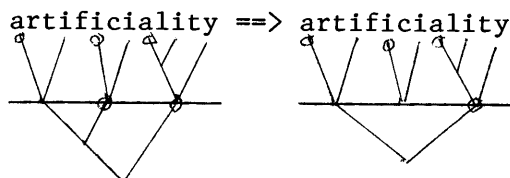
This seems to suggest that destressing is postlexical, but reduction lexical, yet ordered after destressing. Unfortunately, this leads to a paradox, since all lexical rules are supposed to precede postlexical rules.

So far we have said nothing about higher level rhythm or the rhythm that occurs between words. It occurs to us that although rhythm between words is describable in the way suggested here for word-internal rhythm, to do so here would take us too far afield. Likewise, a discussion of higher level rhythm is beyond our purposes here, but like rhythm across words, it too seems describable using our algorithm. Let us briefly consider higher level rhythm to see how readily it could fit within the system proposed here.

Higher level rhythm involves alternations like the following.

artificial artificiality

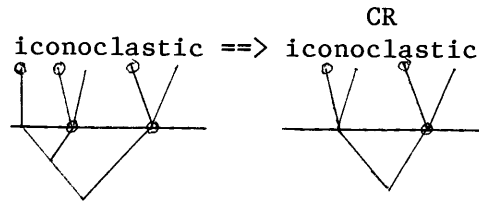
What we find here is that we get rhythm even though the DTEs of feet are nonadjacent. To account for such cases, we propose that CR can apply at higher levels. Thus whole feet can be pruned from the word tree if they clash on that level with the DTE of the word tree. Schematically:



This gives us exactly the right results with respect to the interpretation of rhythm at this level. Since the foot is still intact, we would predict these cases of rhythm to be marked as secondaries in Kenyon & Knott. They are.

Moreover, if we assume that higher level rhythm applies after lower level rhythm, then we have an account for the peculiar behavior of words like: iconoclastic. We might expect these to undergo higher level rhythm, but they don't. This is accounted for by having the mechanism of higher level rhythm be disassociating a foot, while that of lower level rhythm be disassociating a syllable. First, a syllable is disassociated in initial position. That creates a structure that doesn't fit the structural description of higher level rhythm, viz.

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Notice that this explanation depends crucially on the mechanism of disassociation and the absence of Stray Syllable Adjunction. If Stray Syllable Adjunction were to apply, higher level Clash Resolution would still be applicable. The mechanism of higher level rhythm also accounts for why these syllables don't undergo reduction even when light (cf. artificiality). The syllable is still a DTE. The same contrast occurs for applications of the rhythm rule between words. Compare: Montána cówbòy and Míssissíppi législàture. Rhythm is blocked in the first case.

The analysis therefore not only collapses Prestress Destressing, Poststress Destressing, and word-internal Rhythm, but also lays the groundwork for collapsing these in with interword rhythm. A number of desirable consequences have also been reached. Stray Syllable Adjunction has been eliminated as a rule entirely. The word-internal equivalent of the Montana filter has been eliminated entirely. The lexical properties of destressing have been abstracted out and attributed to the rule of laxing. The stress system of Kenyon & Knott has been better accounted for, both in terms of destressing and in higher and lower level rhythm. Finally, this has all been achieved without ever referring to the grid. These consequences come at the cost of proposing a new kind of mechanism and a new interpretation for that mechanism -- dissociation -- and while we obtain some nice results, further research is required to complete the analysis, and to determine if the cost is prohibitive.

FOOTNOTES

*This paper has benefitted from discussion with the following individuals: D. Archangeli, R. Clark, M. Halle, B. Hayes, P. Keating, P. Kiparsky, J. Levin, K. P. Mohanan, D. Pulleyblank, and L. Travis. Any errors are the author's sole responsibility.

¹Cf. SPE and Hayes (1981) where these rules are discussed in a metrical framework.

²We intend these terms in the sense of Kiparsky (1982).

³Latinate prefixes appear to be a problem. Consider the following data.

$\begin{array}{l} \diagdown \text{con} \diagup \text{chology} \\ \text{comptometer} \end{array}$	$\begin{array}{l} \checkmark \text{contemplative} \\ \diagdown \text{combative} \end{array}$
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Latinate prefixes destress even though identical heavy syllables don't. This is apparently a morphological property of the prefix and suggests that destressing must be a lexical rule in order to be sensitive to this property.

The problem with this is that it doesn't account for the other exceptional properties of latinate prefixes. For example, latinate prefixes reject stress in verbs under certain conditions.

cómbat	*cóm̃bat
récúr	*réc̃úr
éxpél	*éxp̃él

An account more compelling is to say that these prefixes are extrametrical. This kind of proposal would account for the rejection of stress in verbs, and the destressing properties, since heavy extrametrical syllables undergo vowel reduction: lieute(nant), tem(pest). This proposal is not complete, but seems promising and is explored in Hammond (in prep.).

Bruce Hayes has observed that the well-known contrast between Hanover and Hånöverian is explained by the lexical status of Laxing. Laxing can't apply in the former, because it's nonderived, but it can apply in the latter, because it's derived.

⁴We assume here Anderson's (1974) discussion of mirror-image notation.

⁵Cf. the paper by Lozano in this volume.

⁶We follow Halle & Vergnaud in marking DTEs with a small circle -- however, the resemblance is only typographical. This proposal differs from theirs in eschewing the grid and in permitting marked trees.

⁷SPE's or Hayes'.

⁸A simple approach to rhythm in terms of trees naturally won't work, as clashes can't be read off of trees directly. An alternative to the grid is the mechanism of metrical locality sketched in Hammond (1982).

⁹Notice that we now have no need of unspecified dominance in the word trees of nonderived items. The interpretation of DTE for CR allows us to maintain strictly right-branching word trees in nonderived words. Cf. Kiparsky (1979).

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