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A METRICAL ANALYSIS OF ENGLISH PREFIXES

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Despite the advances toward explanatory adequacy made by metrical theory in the area of stress rules, English prefixes have been given idiosyncratic analyses even in the most recent of theories. My proposal is that with the addition of a single rule, prefixes become vastly more regular under the assumptions of metrical theory. I will briefly review some of the most prominent accounts of prefixes to show the arbitrary status given prefixal stress. When presenting my ideas later in the paper, except where noted, I will accept the proposals of Hayes (1981). The main idea is that Hayes' theory already accounts for the behavior of prefixes in English.

Stated informally, the problem with prefixes is that some seem to carry stress of their own, some don't seem to affect stress placement, and some act both ways, depending on the situation. This perplexing behavior has compelled researchers to add special provisions to their theories of stress placement in order to allow them to account for prefixes within their frameworks. The treatment of prefixal stress in SPE led to a three-way distinction in the types of boundaries which separate prefixes from their stems. Two of these boundaries are still in use; Aronoff (1976), Siegel (1974) and Strauss (1979) follow SPE closely in stating that there is a class of affixes attached with the + boundary. These are precyclic affixes, have no stress conditions associated with them, and may attach to stems which are not words. Strauss argues that the second class of affixes, those traditionally (since SPE) attached with the # boundary, are actually elements of compounds and therefore the boundary distinction is unnecessary, since the speaker would already need the information that these affixes are stressed by the rules which govern compound stress. The third type of prefix proposed by SPE, attached with the = boundary, was shown by Siegel to be an arbitrary division of what were analyzably all # affixes.

Hayes draws on Siegel and Strauss and stipulates that the Greek-derived prefixes form compounds with the stems they attach to. He cites Siegel's argument that these prefixes can undergo conjunction like compounds: "hyper- and hypothyroid" like "apple and cherry pie". However, this conjunction type is in no way general to either prefixes or compounds, as can be seen from the following:

*penta- and hexagonal	*lamb and pork chop
*hetero- and homonym	*deep-sea and skin diver
*photo- and electrograph	*water and snow ski
*tachy- and bradycardia	*motor and life boat
*bi- and unilateral	*lighthouse and zoo keeper

This data suggests that although extraction and conjunction of

particular items may be indicators of the word status of those forms, they should not be considered infallible tests.

More important, however, is the fact that the compound stress analysis produces the wrong results. Since Hayes never objects to or reformulates Liberman and Prince's (1977, henceforth LP) Compound Stress Rule (CSR), we must conclude that he expects the Greek-derived "compounds" (p. 187, Hayes) to be stressed by the LP rule (p. 257 LP):

CSR: In a configuration of the form [_C A B _C]:
if C is a lexical category, B is strong if it branches.

Hayes cites LP's main examples:

Notice that the Greek-derived prefixes listed by Hayes do not show the effects of this rule:

Compare the examples cited by Hayes in the first column below to the prefix+stem forms in the second column, which by his predictions should behave identically.

Even though many linguists accept that a certain prefix may attach with both classes of boundaries, I contend that the contrasts above have more to do with the monosyllabicity of the stems chosen by Hayes than with the nature of the prefixes themselves. Compare the examples in the first column above to the following Greek-derived prefixes plus monomorphemic, but

polysyllabic stems:

hetero[́]zygote

pseudo-Tatama[́]gouchi

Main stress only falls on the prefix when the stem is monosyllabic. This is the only time when it appears that the CSR is in effect.

Having shown that prefixes are not best accounted for with a compound stress analysis, we are again presented with the problem of how to deal with them. Since metrical theory has proved so successful in the area of stress, and Hayes' is a well-articulated, well-motivated metrical analysis, it would be optimal, in terms of general phonological theory, for prefixes to fit into his system. However, it is clear that the ESR and Strong Retraction, when applied to prefixed words as though they were monomorphemic, produce incorrect results:

epiglottis

hyperextend

Rime Projection

C-ex, N-ex

ESR, Strong Retraction

Word Tree Construction

Prestress Destressing

These trees give the incorrect *epiglottis and *hyperextend.

I propose to account for the correct stressing of prefixed words by a single rule coupled with the assumption that prefixes cycle like stems do. Since this is a controversial proposal, I will make some effort to justify it before formulating my rule.

All of the previous analyses point to the central peculiarity of prefixes: in very informal terms, their "almost but not quite word" status. Even though we showed them to be less than completely general, the arguments of Siegel, Strauss and Hayes about the conjunction of prefixes give credence to the idea that there is some "psychological integrity" given to prefixes that is not ascribed, for example, to suffixes. To draw on our earlier discussion of conjunction in prefixes, even though the first column below might be strange, the second is unimaginable.

?pro- and anti-abortion

?poly- and monosyllabic

?hyper- and hypothyroid

?over- and understated

*happier and -est

*chlorine and -ide

*phonemic and -etic

*schizophrenic and -oid

This "almost word" status can be explained if we propose that prefixes cycle like stems do. This explanation is considerably less arbitrary than SPE's = distinction or Hayes' notion that Greek prefixes equal nouns. In the other analyses, prefixes are accidentally idiosyncratic, each one coming from the lexicon with stress diacritics attached to it, unrelated to other prefixes. My theory captures the generalization that in

isolation, polysyllabic prefixes are stressed according to the ESR when the rule to be introduced shortly is recognized. Here we have a principled set of exceptions being explained by one rule, instead of with marking from the lexicon on individual forms. In general phonological theory, a rule solution, if justified, is to be preferred over lists of diacritics. It is obvious that a rule solution is more plausible in terms of language acquisition; the choice is between either postulating that the child formulates one rule, or that she learns arbitrary lists of classified morphemes. The productivity and generality of prefixation lends evidence to the first choice.

All of these considerations would seem to argue for word status for prefixes. But in fact prefixes are not treated, in general, like words. Extraction from their stem-attached position is impossible for most prefixes; consider the following prefixes in isolation:

*idio *dys *mis *con *ab *hetero *re

Even when some prefixes may be extracted, the circumstances must be quite contrived: "Are you pro or anti Initiative 12?" "Pro." To what, then, do we attribute the ambiguous nature of prefixes? I propose that this status is the result of the cyclic behavior of the following rule:

Prefix Extrametricality:
Rime $\rightarrow$ +ex/_____] prefix

There is nothing extraordinary about this rule; it is formulated in exactly the same way as Hayes' extrametricality rules. In fact, Hayes notes that this rule is independently necessary to insure the correct stressing of the Greek prefixes; they are stressed like nouns (i.e. hétero, not *hetéro). I merely eliminate the source language restriction, making the rule completely general. The only peculiar thing about this rule is that I must say that the final rime of the prefix stays +ex through the word formation cycle, i.e., the rule is in effect one cycle longer than the other extrametricality rules are. This could be what is strange about prefixes, making them hard to extract. In trying to extract them before word formation, they would be "in the middle of a derivation", and it would be impossible to do this, just like it is impossible for any form to appear without having all of the obligatory processes of the phonology which are appropriate to that environment already applied to it. From this we derive the ambiguous nature of prefixes. On the one hand, they cycle, giving them word-like status. This is countered, on the other hand, by the fact that Prefix-ex is in effect through the word formation cycle, making extraction of prefixes (extraction out of the middle of a derivation) ungrammatical, giving the non-word status of prefixes. I am assuming, I think reasonably, that extraction normally occurs after all word formation rules.

Having justified the assumption that prefixes cycle, I turn to exemplification of my analysis.

Derivations that go through the word formation cycle show the interaction of Prefix-ex with other rules of cyclic stressing:

hetero zygote helico graph

Pre Word Formation Cycle

Rime Projection

Prefix-ex, N-ex

ESR

W.F. Cycle

Rime projection with previous structure attached

C-ex, N-ex

ESR (vacuous)

Stray syllable Adjunction

Word Tree Construction

homo nym
o o im
o ø i~~m~~

o ø im
s s
s s
hómonym

Pre W.F. Cycle

Rime Projection

Prefix-ex, C-ex

ESR

W.F. Cycle

Rime Projection with previous structure attached

N-ex

Word Tree Construction

Stray Syllable Adjunction

Stray Foot Adjunction

What is most important to notice at this point is that these derivations are completely in accord with Hayes' theory. The ESR applies to the prefix before word formation can take place, then on the cycle which includes prefix+stem, the ESR can erase structure created on earlier cycles (see the derivation of helicography, below), but Strong Retraction cannot erase structure. Furthermore, the ESR effects the minimal change possible on the pre-existing structure, in accordance with the theory of Kiparsky (1979).

The fact that the final rimes of prefixes stay extrametrical through the word formation cycle should be viewed as a principled oddity about that rule, and not an important exception to Hayes' Peripherality Condition (which states (p. 195) that extrametrical elements lose their extrametricality when not at the edge of the

domain of the stress rules). This is indicated by the fact that in all later cycles, the extrametrical syllables become -ex, as a result of the Condition. Compare the derivation of helicograph, above, to the later derivation of helicography:

Similarly, the derivation of helicographic shows the interaction of the principles being discussed. Hayes notes (p. 154) that ic is an exception to Adjective Extrametricality and is therefore metrical through this derivation.

It is clear from the derivations presented so far that the rule of Prefix Extrametricality is well motivated for the analysis of polysyllabic prefixes. How this analysis applies to monosyllabic prefixes is less clear. One is at first tempted to state that Prefix-ex does not apply to monosyllabic prefixes just like Noun Extrametricality does not apply to monosyllabic nouns. However, the situation is more complicated than this. When attached to a monosyllabic stem to form a noun, a monosyllabic prefix will get main stress, showing clearly that it is not extrametrical at this time: compress_N, program_N. The behavior of monosyllabic nouns and prefixes is apparently the result of a universal condition preventing a string that is entirely extrametrical, but how to formalize this condition is a complex matter. It seems that [+ex] rimes of nouns become [-ex] only if there is nothing else in the string at all. However, if a prefix is attached to a monosyllabic noun stem, Noun-ex is in effect. On the other hand, prefixes

stay extrametrical unless there is nothing else in the string that can receive main stress. This can be seen in the fact that monosyllabic prefixes are extrametrical when attached to verbal and polysyllabic stems:

Word Formation Cycle

Prefix-ex, C-ex

ESR

Word Tree Formation

Stray Syllable Adjunction

If all monosyllabic prefixes were -ex, the ESR would have formed a binary foot over compress, giving *cómpress. The ESR is prevented

from forming a binary foot in immoral, below, so it appears that Prefix-ex is in effect here, too.

Pre W.F. Cycle

Rime Projection

C-ex

Adj-ex

ESR

Stray Syllable Adjunction

W.F. Cycle with previous structure

ESR, ADJ-ex apply vacuously

Stray Syllable Adjunction

immóral

The noun, verb pairs like N_N [convict] N_N [contrast] N_N [pervert] and N_N [suspect] seem to confirm the observation that prefixes are extrametrical except if everything else in the string is extrametrical; however, these results are confounded by the fact that in the verbs, the prefixal syllable, even if it had been footed earlier in the derivation, would undergo pre-Stress Destressing because of the foot that the ESR would have made over the heavy monosyllable in the verb. This is the reason I chose the verb compress to illustrate my point; it is a member of such a noun, verb pair, but has no extra consonant closing the stem syllable. I will leave the two related generalizations unformalized, but I will restate them here:

Monosyllabic nouns are [-ex]only if they are the only elements in a string.

Monosyllabic prefixes are [-ex] only if everything else in the string is extrametrical.

Since this theory accounts for monosyllabic as well as polysyllabic prefixes, subject to possibly universal conditions on extrametricality, all of the traditional divisions of prefixes into different etymological or morphological classes can be eliminated.

There is one more traditional class of prefixes to account for. These are the "transparent" prefixes; under, over, out, in. Because they appear as separate words, these have been assumed to be introduced with the # boundary when they function as prefixes. These can be treated like any other prefixes under this theory, accounting regularly for the contrast between overbite and overdevelopment. However, unlike with the other prefixes, the er in over and under never receives main stress in a fashion analogous to the o in homo: homogenized. It is possible that over and under are underlyingly monosyllabic, and the r syllabifies at surface structure for pronunciation purposes (SPE, Hayes and many others appeal to notions such as this in describing similar forms). Consideration of this type of phenomenon renders even these prefixes regular under the assumptions of this account.

In addition to complete generality and enhanced plausibility in terms of acquisition, my theory has the advantage of deriving as consequences two observations that must be stipulated by other researchers. The first is a condition on the word tree labeling process formulated in LP and cited by Hayes (p. 149):

In the configuration $N_1 N_2$, label N_2 as strong
if...the tree dominates a verb and N_2 dominates
a stem.

Since, in my analysis, the relevant syllables of the prefixes would always be extrametrical at the time this rule would apply, there is no need to make such a stipulation. The reader should notice that Hayes never reformulates this part of the LP rule. The second observation that follows automatically from my theory and not from other treatments is Kiparsky's comment that prefixes tend to form feet of their own. This theory derives this result from the fact that prefixes cycle.

In summary, I have justified the assumption that prefixes cycle and proposed a rule much like Hayes' other extrametricality rules which accounts for many of the apparently unrelated properties of different prefixes. I have shown this analysis to be empirically motivated and theoretically attractive. As a final note, I will admit, following Hayes, that some prefix plus stem combinations are stressed by the CSR; for example, if he is correct in reporting that he says biochemistry and pseudointellectual, I need to allow for compound stressing of some prefixed forms. Though my dialect does not contain these stressings for these words, nevertheless, I do stress

protolanguage and métalanguage on the first syllable, and this shows CSR effects. It is not surprising that some forms with prefixes might be lexicalized as compounds; they might start out as compounds and become more regular through time, c.f. metaphysics. The overriding generalization is that my analysis describes the typical, productive case.

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