

On Certain Bleeding Orders

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- (1) “... it is clear that we must define an order of application on ... transformations” Chomsky (1957, p.44)
- (2) An argument by Chomsky for the necessity of ordering: Passive must precede the T that gives subject verb agreement to ensure that “the verbal element in the resulting sentence will have the same number as the new grammatical subject of the passive sentence”
- (3) There are really two arguments here. We need this order (a) to prevent the Tense/inflectional element (“C”) from agreeing with the underlying subject; and (b) to have it agree with the derived subject (typically the underlying object).
- (4) The first argument is based on overgeneration (and, in a sense, on failure of transparency); the second on undergeneration.
- (5) The former is an instance of the only real kind of rule ordering argument: Stipulating that R1 precede R2 to prevent the generation of an ungrammatical sentence that would be allowed if R2 were to precede R1. In order merely to allow a sentence that could be generated by R1>R2 but not by R2>R1, no stipulated ordering is needed.
- (6) As cogently remarked by Koutsoudas et al. (1974)
“The assertion that two rules are extrinsically ordered in a feeding relation is empirically equivalent to the assertion that the two rules are entirely unrestricted in their relative order of application, i.e. that each rule simply applies to every representation that satisfies its structural description. The equivalence between rules ordered in a feeding relation and ones with no restrictions whatever on their order of application follows from the fact that, in both cases, each rule is applicable to ALL POSSIBLE representations which satisfy its structural description. Neither rule, in other words, is prevented by any specified applicability condition from applying to any possible representation which meets its structural description. To impose any language-specific restriction on the relative order of application of any such pair of rules would be to add to the grammar that includes these rules a statement which is wholly redundant.” p.3
- (7) In passing, I note that one phenomenon widely discussed since the mid-1960's (though not discussed at all in Chomsky (1955), Chomsky (1957)) displayed opacity of the agreement operation on the standard analysis of the 1960's:
- (8) a. There is a woman in the room
b. There are women in the room
- (9) These were assumed to come from structures like
A woman/ women C be in the room

- (10) C first agrees with the subject, then the subject moves rightwards out of its canonical agreeing position, evidently a counter bleeding rule ordering.
- (11) There is a fundamental ordering restriction in Chomsky (1957) on the relation between the rule associating an affix with a verb (familiarily known as Affix Hopping) and the pair of rules responsible for the insertion of supportive *do* in circumstances where Affix Hopping has failed to apply.
- (12) This is explicitly a bleeding order, and is also a counter bleeding order.
- (13) “*do* is introduced as the 'bearer' of unaffixed affix”, as some transformations prior to these have the effect of bleeding Affix Hopping.
- (14) a. Did Mary solve the problem
b. Mary didn't solve the problem
c. John solved the problem and Mary did [~~solve the problem~~] too
- (15) The crucial bleeding relation between Affix Hopping and the do-Support complex is enforced by having Affix Hopping strictly ordered before the do-Support complex, by marking the former as obligatory, and (in principle though not in fact as we will see) by the formulation of the latter in just such a way that its conditions will no longer be satisfied once the former has applied.
- (16) This set of traffic rules and conditions excludes cases where we have do-Support instead of Affix Hopping:
- (17) a *Mary does have solved the problem
b *John does like linguistics (with unstressed *does*)
- (18) And also cases where we have both:
- (19) a. *Mary have does solved the problem (or even *Mary have does solve done the problem)
b. *John like does linguistics
- (20) The relevant Chomsky (1957) rules:
- (21) Auxiliary Transformation (“Affix Hopping”)- obligatory T20
Structural analysis: X - Af - v - Y (where Af is any C or is *en* or *ing*; v is any M or V, or *have* or *be*)
Structural change: X₁ - X₂ - X₃ - X₄ → X₁ - X₃ - X₂# -X₄
- (22) Word Boundary Transformation - obligatory T21
Structural analysis: X - Y (where X ≠ v or Y ≠ Af)
Structural change: X₁ - X₂ → X₁ - #X₂

(23) *do* - Transformation - obligatory also numbered T21 (an apparent typo that has persisted for 56 years; also, I have added the obviously intended end variables in the SA, and thus have made it a 4 term transformation rather than the stated 2)

Structural analysis: $X - \# - Af - Y$

Structural change: $X_1 - X_2 - X_3 - X_4 \rightarrow X_1 - X_2 - do + X_3 - X_4$

(24) The intention is that whenever an affix can hop (whenever it is immediately followed by a verbal element) it will. Whenever it can't, it will obtain a badge of dishonor # on its left side and an affix carrying that mark will obtain a supportive *do*. [# also sets off words from each other, arguably quite a separate task, but here combined with the other, a source of some of the technical difficulties we will see.]

(25) And, crucially, the one place # is NOT inserted is between a verb and an affix that has successfully hopped onto it. This crucial bit of disjunctive ordering is all explicitly stated (i.e., stipulated). At least, that is the intention.

(26) But it turns out to be surprisingly difficult to accomplish this.

(27) First, note that “Af” in (21) - (23) is not actually a symbol of the grammar. It stands for a 5-way disjunction:

$$\left\{ \begin{array}{c} s \\ \text{past} \\ \emptyset \\ \text{en} \\ \text{ing} \end{array} \right\}$$

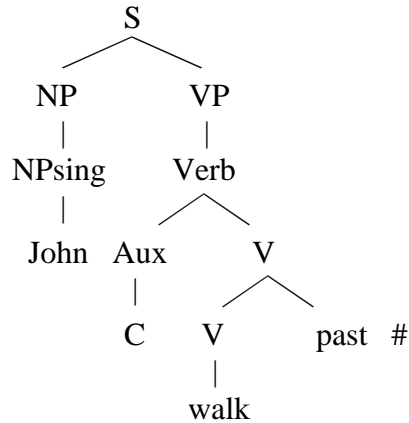
(28) “v” similarly is not in the grammar. It stands for

$$\left\{ \begin{array}{c} V \\ M \\ \text{have} \\ \text{be} \end{array} \right\}$$

(29) The # in (22) is intended to keep the T from applying just between a verbal element and an affixal element that has hopped onto it.

(30) Consider a structure to which Affix Hopping has applied, adjoining *past* onto V:

(31)



(32) Recall that the LSLT/SS model is a set theoretic one. The phrase markers are sets of strings, and transformational applicability is calculated over these sets. If there is a string in the set that satisfies the SA, then the T can apply (and, of course, if the T is obligatory, it must apply). For a variable term, any string, including the null string, satisfies it. For a constant term, satisfaction is identity.

(33) In the set of which (31) is a graphic representation, one of the strings is:

(34) NP Aux V past #

(35) Does this satisfy the SA of (22)? Yes, much too easily, even between V and past, the one place where we don't want the rule to apply:

(36) NP Aux V past #
X Y

(37) Note that **NP Aux V** is not *v* (nor is **past #** *Af*, but that doesn't even matter). Clearly, this is another situation where variables must have been intended. What we really want to do is to divide the string into two parts such that the first part does not end with a verb, or the second part does not begin with an affix, perhaps as in:

(38) SA of (22) (revised): X-Y (where $X \neq Z v$ or $Y \neq Af W$)

(39) This comes closer to capturing the correct restriction. For example string (36), which incorrectly satisfied the original SA of (22), correctly fails to satisfy the revised SA in (38), as desired.

(40) **NP Aux V** does end in V (hence *v*) and **past #** does begin in past (hence *Af*).

BUT there are other relevant strings in the PM, including:

(41) NP Aux walk past #

(42) And this string **does** satisfy the SA in the relevant way (since the symbol *walk* is not the symbol V or M or *have* or *be*), meaning that the SA of (22) is satisfied and the rule will incorrectly insert # between *walk* and *past*, ultimately yielding

- (43) *John walk did
- (44) Thus, the condition for (22), everywhere except where (21) is applicable, is surprisingly difficult to state.
- (45) This is precisely the motivation for the Elsewhere Condition of Kiparsky (1973), attributed by Kiparsky to Pāṇini. [Kiparsky mentions similar principles, with similar motivation, in Anderson (1969) and the 1971 version of Koutsoudas et al. (1974).]
- (46) As Kiparsky stated “an enumeration of the ‘elsewhere’ environments would be complex, and would miss the point that the totality of ‘elsewhere’ environments is exactly the complement of the cases in which [the prior rule] applies.”
- (47) When “we have ... a general case ... which is limited by a special case” we have disjunctive ordering.
- (48) According to Kiparsky, Pāṇini gives the following statement (in Kielhorn’s translation):
 “A rule which is given [in reference to a particular case or particular cases to which, or to all of which] another [rule] cannot but apply, [or in other words, which all fall already under some other rule], supersedes the latter.”
- (49) Kiparsky’s formulation:
 Two adjacent rules of the form
 (i) $A \rightarrow B / P _ Q$
 (ii) $C \rightarrow D / R _ S$
 are disjunctively ordered if and only if
 (a) the set of strings that fits PAQ is a subset of the set of strings that fits RCS, and
 (b) the structural changes of the two rules are either identical or incompatible.
- (50) Interestingly, Chomsky (1955) has quite a similar proposal to that of Pāṇini. While stipulated rule orderings played a huge role in Chomsky’s theory of the 1950’s, he did argue that some orderings should follow from general principles.
- (51) “Any attempt to construct a mechanical grammar of conversions corresponding to a part of some natural language quickly brings out the necessity for restrictions on order of application of conversions even within a level, if large-scale redundancy is to be avoided in the grammatical statement.” p.124
- (52) Chomsky’s statement of the principle relevant to our discussion:
 “Suppose ... that an element a is converted into b in the context $c _ d$, and into b' in every other context. That is, we have rules
 R1: $a \rightarrow b$ in env. $c _ d$
 R2: $a \rightarrow b'$ in env. $c' _ d'$
 where $c' _ d'$ is a specification of all other contexts. We can drop the specification ‘in env. $c' _ d'$ ’, which will in general be quite complex, from R2, if we indicate in the [theory of] grammar that R1 must precede R2.” p.124

- (53) That is, just as in some of Kiparsky's cases, we can state that R2 applies everywhere, and it will only apply in circumstances where R1 didn't. This of course presupposes that R1 alters *a* in such a way that R2 is no longer applicable. That isn't quite strong enough for the present problem.
- (54) But if we further add the requirement of disjunction, as in Kiparsky's statement, a rather straightforward generalization of this ordering principle would seem to solve the Affix Hopping / do-Support interaction problem discussed above.
- (55) For Chomsky (1955), Chomsky (1957), the association of affixes with verbal elements was always via Affix Hopping, regardless of whether the verbal element was a V or an auxiliary (M, *have*, or *be*). But later work argued that auxiliaries associate via a different mechanism: raising of the auxiliary to the inflectional element. See, for example, Jackendoff (1972), Akmajian and Wasow (1975), Emonds (1978) among many others.
- (56) Given this, we have an additional disjunction to consider: We need Verb Raising to apply whenever possible (only with auxiliary verbs in English), and to bleed do-Support, even in those kinds of situation where do-Support obtains when there are no auxiliaries:
- (57) a. Has Mary solved the problem
 b. Mary hasn't solved the problem
 c. John has solved the problem and Mary has too
- (58) a. *Does Mary have solved the problem
 b. *Mary doesn't have solved the problem
 c. *John has solved the problem and Mary does ~~[have solved the problem]~~ too
- (59) One might stipulate that Verb Raising is obligatory and strictly precedes do-Support. However, by the mid to late 1970's transformational grammarians were beginning, albeit often unknowingly, to follow the path earlier blazed by Koutsoudas et al. (1974) for phonology (and by Koutsoudas (1972) and Ringen (1972) even for syntax) and rejecting strict extrinsic rule ordering (as well as stipulated optional/obligatory markings).
- (60) Hence, there was need for a principle capturing the disjunctive relation. In Lasnik (1981) I appealed to a version of the Elsewhere Condition. The basic idea was that Verb Raising mentions both the tense/inflectional element and the auxiliary verb in its SA. Similarly Affix Hopping mentions both the tense/inflectional element and V in its SA. But do-Support mentions only the tense/inflectional element. [This is a slight revision of my actual proposal, more in line with what became rather standard assumptions. In another version of the same basic ideas, presented in a conference in 1995 and eventually published in Lasnik (2003), I offer the speculation that forms of supportive *do* are simply the spell-out of certain inflectional morphemes (including Tense and Imperative) when they fail to merge with a verb.]
- (61) That is, do-Support as stated applies everywhere, but the Elsewhere Condition forces this to mean everywhere except where the other two rules have applied.

- (62) Question: Is the Elsewhere situation stated extensionally over potential input strings, as in Kiparsky's version? Or intensionally over Structural Analyses of rules, as in Koutsoudas et al. (1974)?
- (63) Proper Inclusion Precedence
For any representation R, which meets the structural descriptions of each of two rules A and B, A takes applicational precedence over B with respect to R if and only if the structural description of A properly includes the structural description of B.
- (64) Anderson (1969, p.143) suggests that it doesn't really matter: "Since the structural description of a rule is really a specification of an equivalence class of forms in the language, if one SD is a substring of another, the class of forms corresponding to the longer is a subset of the class of forms corresponding to the latter."
- (65) Chomsky's next (and, as far as I know, last) look at this range of phenomena after the 1950's comes in Chomsky (1991). Here Chomsky is still concerned with the fact that do-Support only takes place if the other relevant rules have failed.
- (66) His proposal this time is kind of a reversal of the old idea that more specific rules take precedence:
- (67) "UG principles [e.g. Move] are applied wherever possible, with language-particular rules [e.g. do-Support] used only to 'save' a D-Structure representation yielding no output ..."
[p.140 in the Chomsky (1995) reprint.]
- (68) Whether this has any further applicability remains to be seen.

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