TOWARDS AN ELEGANT SYNTAX

Michael Brody

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Recent developments in the study of natural language syntax have suggested that theoretical elegance is an aim that should be more central in this area of investigation.

This collection of essays, written between 1980 and 2001, places the search for theoretical elegance at centre stage. The author shows that although the conceptual difference between "elegance" and the minimalist search for "perfection" may appear to be subtle, its consequences are in fact wide ranging and radical. These considerations lead to a markedly different and novel theory of syntax where most of the major features of minimalism, such as derivation, economy, merge, move, phrases and projection, are not just reanalyzed or shifted to other components but in a majority of cases are dispensed with completely or reduced to much simpler notions.

The four-part structure of this book essentially corresponds to the stages in the development of elegant syntax. Articles in the first part of the book examine the search for theoretical elegance within the principles and parameters approach. Essays in the second part show how elegance becomes an organizing principle in the study of syntax. The second and third parts of this volume chronicle some of the various directions that were taken in the search for syntactic elegance. The fourth part is devoted to mirror theory, the theory of syntactic representation in elegant syntax.

Towards an Elegant Syntax makes available some better known and some less easily accessible publications together with a new introduction for the first time.

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INTRODUCTION

This volume attempts to track aspects of the prehistory and development of the research hypothesis first explicitly suggested around 1996, according to which the narrow syntactic component of language is a system whose properties are ultimately determined by gene-independent natural law. There are certain typical properties that, everything else being equal, make theories less elegant and so less highly valued than their respective competitors that do not suffer from such shortcomings. These include, for example, redundancies among theoretical principles, the non-unified treatment of apparently unifiable phenomena or the need for auxiliary hypotheses. Under the assumption that properties of natural language syntax are determined gene-independently, that is, independently from evolutionary *bricolage*, such methodological considerations carry over fully to the study of this component of the human mind.

Recent and not so recent developments in the study of natural language syntax suggest that theoretical elegance is an aim that may well be worth taking to be more central than usual in this domain. The concept of elegance apparently differs quite significantly from the notion of perfection as used in the mainstream minimalist literature. Before looking at this, let me quickly try to put aside a point that to my mind confuses the issue, at least in the form it is usually presented.

It is sometimes suggested that the notion of perfection used in the minimalist approach does not refer to the theory (of language) but to the object (language) the theory is a theory of. This sense of perfection is difficult to understand. In particular it is not clear how at some point in time t we can say anything about what some object is or what properties it has, over and above what our best theory of that object tells us – on the basis of all available evidence at t.

Let us ignore potential alternative interpretations of this suggestion, which as far as I know have never been explicated. In one sense in which it has been used, perfection is just a synonym for elegance – at best a terminological issue. This terminology now appears to obscure rather than clarify in that it is (and has been) easily associated with other senses in addition to that of theoretical elegance.

In a related but different second sense, perfection (and near-perfection) are effectively "engineering" terms. They presuppose a task and an evaluation measure – where both task and measure may be complex. Degrees of perfection tell us how well

(in the simplest case, how elegantly) the task has been accomplished by a particular system. This approach clearly involves more conceptual apparatus than whatever is involved in the search for theoretical elegance. Elegance is embedded here in a logically prior frame involving the predetermined task and the task-relative evaluation system. In other words the question of what counts as elegance is complicated under this approach, at least by the added issue of having to determine the task for which elegance will be measured. Given that there are in principle many potential tasks from which to choose, this assumption at the very least makes the search for the best theory more complex. At the same time, the approach has a less ambitious aim than the one that simply requires a theory to be elegant: the best theory now need not be elegant, only the optimal one for some adopted purpose.

Although facts might conceivably force us eventually to a stance in the spirit of task relevant (near-)perfection, the approach is clearly an undesirable one when a less complex alternative is available that additionally assumes that the best case obtains. Furthermore I think it is generally fair to say that assuming the task-relevant perfection approach typically has a somewhat demoralizing effect: it has made it respectable to come up with inelegant analyses, that is, less than optimal explanations, and defend them as containing somewhow inevitable imperfections. In my view, this has invariably led into blind alleys. As a prominent example of this phenomenon, take the case of move, which has invariably been regarded as an imperfection in the minimalist view[1] until very recently.[2] In the framework of elegant syntax taking a syntactic relation to be "imperfect" has been ruled out on principled grounds essentially from the outset: "… Move cannot be … [an imperfection]. It is therefore necessary to find a different conceptualization for this relation."[3] The approach which allows move/chain not to be an inelegant addition in fact has much in common with the more recent minimalist proposal.

Thus it seems to me that the effectively used sense of (near-)perfection is exploited in actual practice only to deflect even the apparently satisfiable requirements of theoretical elegance. Both for this reason and for the theoretical undesirability of the engineering sense of perfection noted above, I shall continue to adopt the theory that more simply aims for elegance. To avoid confusion I shall not use perfection as a synonym of elegance. In my earlier publications I have, however, followed the minimalist terminology for some time, and used perfection in this sense, with the implicit suggestion that the term perfection is best understood in the sense of elegance. This led to some misunderstandings and after some hesitation I have switched terminology somewhere around the end of the 1990s, and started to refer to the approach as elegant syntax. I have not changed the original wording in this volume, so in various earlier papers perfection and perfect syntax should be read as elegance and elegant syntax, respectively.

The distinction between task-oriented perfection and theoretical elegance may appear to be subtle, but a strict adherence to the latter resulted in the last eight years or so in noticeable simplifications. The resulting theory of syntax (one of potentially infinitely many that are compatible with the central role accorded to elegance) eliminates or simplifies many or most characteristic properties of the minimalist approach.

It is not the case of course that all outstanding theoretical problems have found their solutions. However, it seems clear that elegant syntax leads to a rather different picture from the more standard view. Concepts like derivations, economy, merge, move, phrase, projection, c-command, jointly provide a reasonable characterization of the apparatus of the minimalist framework. Syntax internally now all these appear to be either fully redundant or reducible to much simpler notions (see the parts on "Towards an elegant syntax" and "Aspects of mirror theory").

Although elegant syntax and the minimalist approach apparently differ significantly, there are also aspects in which they are parallel enterprises that are near enough not only to adopt ideas from each other but sometimes even to transplant specific solutions and mechanics with minor modifications. There are in particular a number of cases where considerations of elegance led to results that were later apparently independently arrived at in the minimalist framework in which considerations of elegance are less prominent but of course not missing altogether.

I have already cited one case relating to the question of whether the move/chain relation is an imperfection. Another example is the idea that LF is the basic syntactic level. This has also originated from considerations of architectural elegance already in the early 1980s.[4] In the late 1980s when the claim was slightly more elaborated,[5] Chomsky (1987) took this claim to deny the existence of other syntactic levels, essentially as later proposed by Chomsky himself in 1992 and 1995. At this earlier time however, he argued quite strongly against it on (admittedly weak) empirical grounds. It was in fact in the early 1990s (Brody 1992, 1993),[6] where the argument for eliminating D-structure was more carefully presented. Almost identical arguments for this point were independently given by Chomsky 1995.[7] In this work the centrality of LF (as opposed to D- or S-structure) was also prominently and strongly adopted.

Or take another instance, where expletive-associate chains[8] share crucial properties with later minimalist feature movement and probe-goal Agree structures.[9] Or the arguments that even if one adopts a derivational view, syntax should involve a single cycle[10]– although in part for additional reasons, the mainstream minimalist view is now in agreement with this point.[11] There are various other cases of this kind that an attentive reader of the volume will no doubt notice, from the early treatment of empty categories within the Principles and Parameters theory[12] to the approach to checking theory and in particular to the role of deletion and invisibility.[13]

The relative systematicity of such cases, where focusing on theoretical elegance makes it possible to reach certain types of results that the minimalist approach can adopt or rediscovers, sometimes much later, is suggestive. On the view that such results are not completely insignificant, the situation may be taken to hint at the correctness of the view that considers elegance a primary objective, perhaps even a tautologous requirement of (syntactic) theory construction.

Articles in the first part of this book search for theoretical elegance only within the Principles and Parameters approach. From the late 1980s, (here from the second part onwards) elegance becomes an organizing principle that in certain crucial respects dictates the choice of the framework. As indicated above, these considerations eventually lead to a quite different theory of syntax where most of the major features

of minimalism are not just reanalyzed, or shifted to other components, but where many, perhaps their majority, are either dispensed with completely or reduced to what is perhaps their genuinely conceptually inevitable core – in any case to a rather more impoverished conceptual apparatus. The second and third parts of the volume chronicle some of the various directions and stages in the search for elegance in the theory. The final part is devoted to mirror theory, the theory of syntactic representation in elegant syntax.

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PRINCIPLES AND PARAMETERS

1

ON CIRCULAR READINGS

1. Introduction

It is well known that there are a number of constraints determining what are the possible positions of a linguistic antecedent of a given anaphoric expression. (1a,b) for example are ill-formed on the reading indicated; they cannot legitimately express the meaning of (2a,b). (Co-indexing marks anaphoric relationship between constituents.)

(1) a. *He$_x$ said Tom$_x$ was ill
    b. *Tom$_x$ saw him$_x$
(2) a. Tom$_x$ said he$_x$ was ill
    b. Tom$_x$ saw himself$_x$

Consider now (3), which contains a structure where the antecedent includes the anaphoric expression:

(3) *I met [$_x$her$_x$ childhood friend's wife]

The meaning that we should expect (3) to have is something like (4).

(4) I met the one$_x$ who$_x$ is her$_x$ childhood friend's wife

Just as in the case of (1a,b) a structural constraint can be stated that rules (3) ungrammatical.[1] In this chapter, I shall consider the further question of whether the effect of this constraint follows from some independent considerations. An account of such structures has recently been proposed in a paper by James Higginbotham and Robert May (1979), (henceforth HM), to which I shall refer as the pragmatic solution. This crucially involves a pragmatic principle that is often assumed in some form in the different approaches to the problem of the interaction of content and context, represented at this conference. I should like to argue below that this solution, although at first sight plausible, is not tenable. I shall present an alternative explanation, one that involves what are probably not pragmatic principles but rules of grammar.

According to the pragmatic solution, a structure like (3) with the referential dependency as indicated (henceforth Circular Reading (CR)) "is in a certain sense

absurd, for the reference of some of the terms that it contains is given only circularly" (HM, pp. 20/21). This absurdity is due to the general condition of use "that speakers are expected to provide sufficient cues for the determination of deictic reference" (HM, p. 21). So in the case of a CR, the reference of a pronoun is dependent on some NP, NP*, hence varying the context cannot, by hypothesis, provide contextual cues for the determination of the pronoun's reference. On the other hand, it is assumed, that NP* is unable to supply this reference, since the reference of NP* is itself dependent on that of the pronoun. "Intuitively, the reference of a pronoun cannot be 'given' in terms of itself" (HM, p. 109).

This solution then rests on the truth of two claims: (a) that there is a pragmatic condition that the reference of a pronoun must be identifiable and (b) that CR structures fail to satisfy this condition. The first of these claims has an air of naturalness about it, which I think is misleading. Suppose that the reference of a pronoun P is not determinable in some context. Why could not P be interpreted as a free variable? Since there seems to be no a priori reason why there could not be expressions with free variables in them in natural language, the pragmatic principle is in need of independent motivation. The second crucial premise of the pragmatic solution is that the reference of the pronoun in a CR structure is not determinable. I shall argue that this premise is false, and therefore whatever the status of the pragmatic condition, it cannot provide an explanation of the unacceptability of structures like (3). But before doing this, I should like to present some more relevant data and introduce some terminology with the help of which the problems the new data gives rise to can be stated.

Consider (5) and (6):

(5) a. *[$_x$her$_x$ childhood friend's wife]
b. *[$_x$the fact that you believed it$_x$]
c. *Tom [$_x$wanted to appear to $\emptyset_x$]

(6) a. *[$_y$her$_x$ employer] respects [$_x$his$_y$ secretary]
b. *Everybody who says [$_y$Fred proved it$_x$] agrees [$_x$that Mike denies it$_y$]
c. *The boy who [$_y$mentioned that Bill will $\emptyset_x$] saw the girl that [$_x$announced that someone had $\emptyset_y$]

(5b,c) show that the full explanation of the unacceptability of CRs will have to take into acount not only co-reference relationships but anaphoric connectedness in general. (The sense in which I shall use the term "anaphora" here is meant to exclude rules of sentence grammar.)[2] As (6) shows, the description of CR structures as ones in which the antecedent contains the anaphor, is not exhaustive: the same type of unacceptability results also if the antecedent of an anaphor A contains anaphor B whose antecedent contains A.

Let us call the relation in which the interpretation of an anaphor stands to that of its antecedent "anaphoric dependency"; and the relation in which the interpretation of some segment stands to that of its constituents "compositional dependency." Let us furthermore define the relation "a-c dependency" as holding between two

interpretations A and B iff A is anaphorically dependent on B, or A is compositionally dependent on B. The ungrammaticality of (5) and (6) could now be described by stipulating that (a) a-c dependency is transitive and that (b) the a-c dependency of an anaphor's interpretation on that of its antecedent is asymmetric, that is if A a-c depends on B, and A is an anaphor's interpretation, then B does not a-c depend on A. The CRs now lead to contradiction. In (5a), for instance, the interpretation of the anaphor *her* is a-c dependent on that of the NP *her childhood friend's wife*. The asymmetry of this dependence (stipulation (b)) entails that the interpretation of *her childhood friend's wife* does not a-c depend on that of *her*. But it does in consequence of the compositionality principle. Given the transitivity of a-c dependence, we can similarly derive contradictions from the CRs of (6).

A-c dependence incorporates only anaphoric and compositional dependencies. The fact that these two are under a transitive "super-relation" cannot be a consequence of a general property of dependencies between interpretations. The interpretation of a variable, for instance, depends in some sense on that of its quantifier: its reference varies within the limits set by its binder. Nevertheless, this dependency must not be included under a-c dependency, if it was, (7) would be incorrectly excluded.

(7) a. Tom [$_x$kissed every girl Peter did $\emptyset_x$]
b. [$_y$Every girl Peter did $\emptyset_x$] Tom $[\text{kissed } y]_{\text{VP}^*_x}$

On some level of analysis (7a) will have to have a representation like (7b), evidence for Quantifier Raising and for the identity condition on VP-anaphora converge to support this.[3] Assume that the stipulations about a-c dependency made above refer to this level. Here the zero VP asymmetrically a-c depends on VP* by stipulation (b). VP* in its turn a-c depends on the variable (related to the extracted quantifier phrase), as does the quantifier phrase on the zero VP. Thus given the transitivity of a-c dependence, if the variable a-c depended on the quantifier, we should end up with a contradiction and the structure would be incorrectly excluded. VP* a-c depends on VP (by transitivity of a-c dependence) and VP* does not a-c depend on VP (by asymmetry of the a-c dependence of an anaphor's interpretation on that of its antecedent). Thus "behaving transitively" with respect to anaphoric or compositional dependence is not a general property of interpretive dependencies.

At least three questions arise at this point. First, why do anaphoric and compositional dependencies interact, and why in this particular way by forming a transitive chain? Note that described in these terms, the fact that the structures in (6) are just as ungrammatical as the apparently related ones in (5) is not a logical necessity, hence surprising in a linguistically interesting sense. Second, from what independently motivated consideration could it be made to follow that it is just these two and no other relations that form such a chain that can create contradictions with the entailments of the principle of asymmetry? Again it is worth noting that the grammaticality of (7a) seems to be an unexpected and genuinely puzzling fact when this structure is compared with (5) and (6). Third, the same question could be asked about the principle of asymmetry. Could some independently motivated consideration

explain the asymmetry of the a-c dependence of the interpretation of an anaphor on that of its antecedent? We shall see in the next section that this is not a property of dependencies between interpretations in general either.

The two stipulations concerning a-c dependency are *ad hoc*. Nevertheless, they are quite natural and it is not obvious if they should not be taken as axioms. But I shall attempt to search for explanations.

2. The inadequacy of the pragmatic solution

Returning now to the pragmatic solution, we note that in this only examples like (5a) and (6a) are considered, that is, ones containing pronouns and dependencies between referents. Given this limitation of the data, the problem of explaining why anaphoric and compositional dependencies interact does not arise. In (5a) and (6a), only referential dependencies (both anaphoric and compositional) occur. It is indeed difficult to imagine how this relation could fail to be transitive. However, the problem of explaining the asymmetry of anaphoric dependence does show up. Why is it that sentences in which the reference of some pronoun A depends on that of some segment B, where B's reference depends on that of A, are unacceptable? I shall return to the problem of explaining the interaction of anaphoric and compositional dependencies in later sections. First I should like to reconsider the explanation given by the pragmatic solution of the unacceptability of CRs with referential linkages. From our present point of view, this is an attempt to explain the asymmetry of referential dependence, i.e. to give a partial answer to problem (3) of section 1. I shall then go on to examine the potential of this solution to serve as a basis for an explanation for the asymmetry of the a-c dependence of anaphors other than pronouns.

Recall that according to the pragmatic solution, the reference of a pronoun in a CR structure is not determinable, this being due to it "being given in terms of itself."

"In this respect, pronouns are no different from other singular or plural terms. If one wanted to know who the name *Cicero* refers to, it is of no use to be told that it refers to the person people refer to when they use that name, for what we wanted to know was *who* that was." (HM, pp. 19/20). HM appear to assume then that some principle like (8), call it the Circularity Principle, is logically necessary:

(8) If the reference of some segment A is given circularly, that is, if it is dependent on that of another segment B, and the reference of B is dependent on A, then the determination of the reference of A cannot be effected.

If this was indeed a necessary principle, then the asymmetry of referential dependence would be explained. Whenever the pronoun both depends on and is depended on by some segment, this leads to leaving the pronoun without a determinate referent and hence to the exclusion of the structure by the pragmatic constraint. However, the Circularity Principle is not logically necessary, and even if it was, the solution would not be generalizable to the whole range of data.

The "Cicero" example appears to be misleading. The absurdity there is not due to circularity, but simply to the uninformativeness of the answer. Thus someone who would like to know who the name "Cicero" refers to can be informatively, though "circularly," answered by stating that it refers to the person who just uttered the name "Cicero." The explanation can be proper and truthful in appropriate circumstances. The example is irrelevantly complicated since "Cicero" is being mentioned in it instead of used as pronouns in CRs are. To take another, perhaps more perspicuous analogy, consider (9):

(9) $c = 1/c$

Suppose that "c" may take values in the domain of integers. The specification that the actual value of "c" equals the value of "1/c" may be circular, but is perfectly adequate, picking out 1 and -1.

It is neither necessary nor sufficient for a proposition to be a syntactic definition in order for it to pick out determinate referents that satisfy it. Of course it can be assumed that the relation between antecedent and anaphor is that of definiens and definiendum, or that the interpretation of an antecedent must be computable independently of (without access to) the interpretation of the anaphor. If some such step was made, asymmetry of the dependence of the interpretation of an anaphor on that of its antecedent would follow. But these assumptions, although perhaps natural, are neither necessary nor independently motivated, so they represent no improvement on the equally natural axiom of asymmetry of a-c dependence of the anaphor's interpretation, which I set out to explain.

Circularity in and of itself does not make the computation of the anaphor's and the antecedent's interpretation a difficult or even unparalleled task either. Computing the interpretation of an anaphor participating in a CR could be similar to disambiguation. Thus in (10), one of the possible meanings of *ball* is filtered out by selectional restrictions.

(10) the ball's trajectory

In (10), the interpretation of *ball* depends on that of the whole NP, whose interpretation in turn depends on that of *ball*. CRs could be dealt with in an exactly parallel fashion. Take (5a) for instance. Here the reference of *her* depends on that of *her childhood friend's wife*; whose reference in turn depends on that of *her*. In both cases, the contained NP (*ball*/*her*) has a number of possible interpretations/referents from which that or those will be picked out that meet(s) further conditions imposed by the container NP. It will have to be checked, for each possible interpretation/referent of the contained segment, whether it meets these: the selectional restrictions of the whole NP's interpretation in the former case, the identity requirement with the whole NP's reference in the latter. We can then conclude that the Circularity Principle is not logically necessary, and neither is the asymmetry of the dependence of a pronoun's reference on that of its antecedent.

But even if the Circularity Principle was necessary or independently motivated, no satisfactory solution could be based on it for the full range of data in (5) and (6). Asymmetry of a-c dependence is a property of the interpretation of all anaphors, it is not characteristic only of pronouns' referents. To explain this in the spirit of HM's solution, a stronger version of the Circularity Principle would have to be necessary, which refers not only to referential dependencies but to dependencies between interpretations in general:

(11) If the interpretation of some segment A is given circularly, that is if it is dependent on that of another segment B, and the interpretation of B is dependent on A, then the determination of the interpretation of A cannot be effected.

But this revised principle is not just not necessary or motivated, it is false. As the cases of disambiguation and of the antecedent-contained VP-anaphor (7) show, it is possible to have circular dependencies between interpretations in grammatical structures.

Summarizing so far, I have argued that the pragmatic solution is unsatisfactory for several reasons. This account of the unacceptability of CRs with referential linkages makes use of two assumptions: the pragmatic principle that the reference of a deictic expression must be determinable, and the Circularity Principle according to which CRs fail to satisfy this condition. Neither of these assumptions seems to be necessary or independently motivated.

But even if the account was accepted as an answer to the problem of why referential dependency is asymmetric, it would not be generalizable to explain the asymmetry of anaphoric dependency in general. Hence at best, the pragmatic solution could only have been a partial answer to one of the three central problems of CRs. It does not contribute at all to the solution of the problems of why anaphoric and compositional dependencies, and only these, interact by forming a transitive chain.

3. Referential chains and asymmetry

I shall persist in trying to find an answer to the asymmetry problem, whose solution, as will be seen, provides the answers automatically to the other two problems posed in section 1. I will approach this by gradually modifying the framework presented in Higginbotham and May's paper.

According to HM, structures with CRs have "referential chains" that may be infinitely long. Referential chains are hypothetical objects, part of a full semantic representation. Briefly, if the reference of a pronoun A depends on that of the NP B, then "A $\rightarrow$ B" may form part of the chain representing that B is the antecedent of A. Furthermore, if a segment C *contains* another, D, where C and D are in the referential chain by virtue of being on the right-hand side and on the left-hand side respectively of an arrow, this will be shown by linking C and D in the following notation: "C $\supset$ D."

So for example the referential chain of (6a) "[$_y$her$_x$ employer] respects [$_x$his$_y$ secretary]" on the reading marked may contain "her$_x$ $\rightarrow$ [$_x$his$_y$ secretary]" and "his$_y$ $\rightarrow$ [$_y$her$_x$ employer]." Since both "[$_x$his$_y$ secretary]" and *his*$_y$ are in the chain they are linked by "$\supset$":

(12) her$_x$ $\rightarrow$ [$_x$his$_y$ secretary] $\supset$ his$_y$ $\rightarrow$ [$_y$her$_x$ employer]
"[$_y$Her$_x$ employer]" includes *her*$_x$ so (12) can continue as (13):

(13) her$_x$ $\rightarrow$ [$_x$his$_y$ secretary] $\supset$ his$_y$ $\rightarrow$ [$_y$her$_x$ employer] $\supset$ her$_x$

But now the reference of the last *her* in (13) again depends on that of the NP "[his secretary]," so the construction of the chain need not stop here.

Let us make the following natural assumption:

(14) All pronouns and pronoun containers in the referential chain must initiate an element of the form "A $\rightarrow$ B" or "A $\supset$ B" respectively.[4]

Now the chain of (6a) appears to have to be infinite. Referential chains and (14) can be generalized as anaphoric chains in the obvious way. Since the chain is part of the semantic representation, structures with CRs can be excluded by the assumption that grammars must not assign an infinite representation to a finitely long sentence. Semantic representations must be accessible. This it would seem should be considered as a necessary property of grammars. Asymmetry of the a-c dependence of an anaphor's interpretation on that of its antecedent seems to fall out now.

This solution, however, does not work as it stands. Note first that even if it did explain asymmetry, it would not be satisfactory. It offers no hope of an explanation to the first two problems of section 1: why do anaphoric and compositional dependencies interact transitively, and why is it just these two dependencies between interpretations that do so? Anaphoric chains only stipulate and do not explain this. It would be, for instance, incorrect to include the dependence of the interpretation of a variable on that of its quantifier in the anaphoric chain (cf. (7)), but no motivation independent of the present problem can be given against this. But asymmetry is not explained either. The idea that referential chains for CRs will be infinite is crucially used (and generalized to anaphoric chains). But in HM's framework, this is incorrect even if (14) is accepted. This is because according to HM, the annotations of the chain only relate entities: "The items themselves in the referential chain are definite occurrences of NPs in the logical form" (HM, p. 19).

To see the problem, with this in mind, reconsider the referential chain of (6a). At the stage where the first four steps have been constructed, it may look like (13). But under the present assumptions about the status of the items in the referential chain, there will be no fifth step, since the last item in (13) is the same as the first: a definite occurrence of an NP in the logical form. The last *her* in (13) must of course initiate an element of the form "A $\rightarrow$ B" under (14), but it already has. This is the one that the first *her* in (13), with which the last one is identical, has initiated. It seems then that if the explanation of the unacceptability of CRs based on the infiniteness of the relevant anaphoric chains is to be maintained, then it must be ensured that the first

and the last *her* in (13) are not identical. To do this, the assumption that the annotations of the anaphoric chain only *relate* entities must be given up; they have to create new ones.

4. Anaphoric expansion

Is there any independent evidence for such a modification? To show that there is, I have to describe some data first noted and analysed by Jacobson (1977). She pointed out the difference in acceptability between (15a) and (15b) and the fact that it can be accounted for under the assumption that the first pronoun in (15a,b) (*her*), is represented at some level as a full NP identical to the pronoun's antecedent, as in (16a,b).

(15) a. [$_y$The man who$_y$ *y* loved her$_x$] kissed [$_x$his$_y$ wife]
b. *[$_y$The man who$_y$ she loved *y*] kissed [$_x$his$_y$ wife]
(16) a. [$_y$The man who$_y$ *y* loved [$_x$his$_y$ wife]] kissed [$_x$his$_y$ wife]
b. [$_y$The man who$_y$ [$_x$his$_y$ wife] loved *y*] kissed [$_x$his$_y$ wife]
(17) a. *[$_y$the man who$_y$ *y* loved [$_x$his$_y$ wife]]
b. [$_y$the man who$_y$ [$_x$his$_y$ wife] loved *y*]

Some constraint will have to differentiate between (17a) and (17b) marking only the latter as deviant. Assume that it will be sensitive to the relative order of the variable (related to the *wh*-phrase) and the co-indexed pronoun. But whatever the precise formulation of this condition, it can automatically account for the difference between (15a) and (15b) provided that it has access to the level at which (15a,b) are represented as (16a,b) respectively.

HM build this into their framework in the following way. They stipulate what I shall call the Target Condition:

(18) The target of an annotation entry (i.e. the right hand side of an arrow "A → B") must not "contain a free variable, as such targets have reference only relative to an assignment of values to variables. In general a target NP$_i$ which gives the reference of a pronoun$_j$ must be *closed*, where NP$_i$ is closed iff every anaphor contained in NP$_i$ has a c-commanding antecedent in NP$_i$ (understanding containment as a reflexive relation)." (HM, pp. 18/19)

(Keep in mind that "anaphor" in this quotation refers to dependent elements participating in sentence grammar binding processes. This is in contradistinction to the way the word is used elsewhere in this chapter to mean the dependent members of "discourse grammar" associations.) Furthermore, it is stipulated that there is to be an exception from the Target Condition: annotations that violate it are permitted "where their semantic interpretation is determined by the result of substituting the target for the pronoun" (HM, p. 25), in other words, where the substitution will result eventually in a well-formed semantic representation.

In the derivation of (15a), the annotation that associates *her* with *his wife* has a target that violates the Target Condition; *his* is not bound from within the NP *his wife*.[5] Therefore this annotation is only legitimate if *his* can end up bound when *his wife* is substituted for *her*. After substitution, as in (16a), *his* can be properly bound.

(15b) is not similarly derivable since the pronoun *his*, in the substituted NP *his wife*, cannot have the same index as the variable that is linked to the *wh*-phrase and is to its right in consequence of the constraint that excludes (17b).

This analysis relying on substitution presupposes just like Jacobson's the existence of a level where certain pronouns are represented *in situ* by their antecedents, and not in abstraction from the rest of the structure. This is necessary in order to check whether conditions of proper binding are met by the substituted segment. Here we have evidence, then, for reinterpreting, at least in some cases, the annotation "A $\rightarrow$ B," relating logical form entities as a rewriting rule expanding A as B. It is natural to think of this rule as part of the mapping to a full representation of meaning.[6] Note that the analysis creates unmotivated distinctions between the interpretations of parallel structures. For instance, different structures are assigned to (15a) and (19). Since in (19), *her* has a closed target (*Mary*) there is no substitution:

(19) The man who loved her$_x$ kissed Mary$_x$

Suppose that the generalization is made that *all* anaphoric pronouns (i.e. those not bound by some antecedent in a sentence grammar process) have to be expanded when they have linguistic antecedents. (15a) and (19) will now have parallel mappings. The expansion of the first pronoun in (15a,b) will fall out from general principles: all anaphors expand. Note that the second pronoun in (15a,b) need not expand since the relation between it and its c-commanding antecedent is not anaphora in our sense, but that of sentence grammar binding.[7] The Target Condition becomes superfluous here as does its *ad hoc* exception covering the case of substitution. Since the "all expansion" account does not have recourse to anything not assumed in HM's theory, it is also more parsimonious in being able to dispense with anaphoric chains.

5. Some consequences

Equipped with evidence that all anaphoric pronouns must be substituted by a copy of their antecedents at some level of representation, I can return to the three problems that were posed at the outset. This theory can explain the asymmetry of the dependence of the pronoun's reference on the reference of its antecedent. It is now genuinely a consequence of the inadmissibility of inaccessible semantic representations. Given that an antecedent has to be copied in for all anaphoric pronouns, no fully expanded semantic representation will ever be reached for a CR. In (5a) for example, the anaphor *her* expands as *her childhood friend's wife*; in which *her* expands again as *her childhood friend's wife*, and so on.

The arguments originally advanced for the syntactic treatment of a great number of anaphoric processes (Grinder and Postal 1971, Hankamer 1973, Ross 1969, etc.) do not stand up when turned against more sophisticated interpretive theories. But they are as yet unrefuted if constructed as showing the necessity of countenancing the existence of some level where anaphors are expanded, represented by a copy of their antecedents. These arguments taken together with Jacobson's, discussed briefly in section 4, would seem to argue strongly for generalizing the expansion treatment to

all anaphoric processes of discourse grammar (in the sense of Williams 1977).[8] If so, then the generalization of the explanation given for the ungrammaticality of (5a) to examples like (5b,c) is independently motivated. This solves the third problem of section 1, the asymmetry of the anaphor's interpretation on that of its antecedent.

Why does the ungrammaticality of CRs extend from the self-embedding patterns of (5) to the crossing ones of (6), the first of the three problems posed at the outset? The present theory provides an answer to this too. Anaphoric dependency interacts transitively with compositional dependency because expansion rules translate, as it were, the former into the latter. So to take (6a) for example, the interpretation of *her employer* compositionally depends on that of *her*, the interpretation of *her* anaphorically on that of *his secretary*. But at the level where the expansion rule has applied to *her*, it is represented as *his secretary* (copy). So *her employer* will simply compositionally depend on *his secretary* (copy). The makeshift notion of a-c dependency becomes superfluous.

This solution automatically provides an answer to the second problem of section 1, for which, just like for the first, anaphoric chains held no promise of an explanation. Only anaphoric dependency interacts with compositional dependency because expansion is motivated only for anaphors. There is no syntactic motivation for the substitution of a variable by a copy of its quantifier or of course for the expansion of a lexical item in the shape of a segment whose selectional restrictions disambiguate it. Expansion in these cases would also produce semantically nonsensical results.

In summary, I have argued that the condition that deictic expressions must have determinable referents has no role to play in the explanation of the unacceptability of CRs. An alternative explanation was put forward that was based on independently motivated rules and which was able to account for some interesting properties of CR constructions.

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2

ON CONTEXTUAL DEFINITIONS AND THE ROLE OF CHAINS

1. Introduction

1.1. Contextual definitions

A basic assumption of the Government-Binding theory of Chomsky (1981) (henceforth LGB) is that NPs are (exhaustively) partitioned by the properties +/− pronominal, +/− anaphor. This makes it possible for various subtheories of grammar that are sensitive to these distinctions to operate. Empty categories are not overtly marked with respect to these properties, but they must still be assigned to the appropriate subclass.

(1) a. *Tom$_x$ is illegal e$_x$ to go there
    b. *Tom$_x$ hit e$_x$
(2) a. It's illegal e$_x$ to go there
    b. Tom$_x$ tried e$_x$ to go there
(3) a. Tom$_x$ seems e$_x$ to go there
    b. It$_x$ seems e$_x$ to be obvious that Mary left
(4) Who$_x$ did Tom hit e$_x$

For example, the Empty Category Principle (ECP), which rules out ungoverned non-pronominal empty categories, will exclude (1a) only if the empty category in this structure is taken to be a nonpronominal (trace). The condition that an empty pronominal anaphor (PRO) must be ungoverned, a consequence of the binding theory of LGB, rules out (1b) only if the empty category here is a pronominal anaphor. We may assume that for principles of interpretation to function correctly, the empty categories in (2)–(4) must also be assigned to the appropriate subclasses. In the system of LGB the empty category is a pronominal anaphor in (2), a non-pronominal anaphor (NP-trace) in (3), and a non-pronominal nonanaphor (*wh*-trace/variable) in (4).

In LGB Chomsky also postulates principles that characterize empty categories as +/− pronominal, +/− anaphor on the basis of their context. These so-called *contextual definitions* are reproduced in (5) (LGB 330).[1]

(5) a. α is a pronominal iff $\alpha = [_{NP}$ F,(P)], where P is a phonological matrix and F $\subset \phi$ and either (i) or (ii)
(i) α is free
(ii) α is locally A-bound by β with an independent θ-role.
b. α is a variable iff α is locally $\bar{A}$-bound.
c. If α is an empty category and not a variable, then α is an anaphor.

The conditions in (5) ensure that the empty categories in (1)–(4) are properly characterized. Consider first (5a). ϕ is the set of features that pronouns and empty categories are allowed to have (e.g. gender, number). Thus, (5a) from right to left entails that the empty category in (1b) and (2) is a pronominal. Since it is empty, all of its features are drawn from ϕ. It is free in (2a), satisfying (5ai), and A-bound by an element with an independent θ-role in (1b) and (2b), satisfying (5aii). From left to right (5a) predicts that the empty categories in (1a), (3), and (4) are nonpronominals, since they are either bound by an NP with a dependent θ-role (that is, one that has been assigned in the position of the empty category and then transmitted by it to its antecedent), as in (1a) and (3a), or by a category without a θ-role, as in (3b) and (4). Given (5b), the empty category in (4) – and it alone of the empty categories in (1)–(4) – is a variable, since it alone is $\bar{A}$-bound. (5c) requires all nonvariable empty categories to be anaphors; therefore, all empty categories in (1)–(3) are anaphors.

But the conditions in (5) are really superfluous here, since the above classification of the empty categories in (1)–(4) follows from independently motivated principles. Thus, the fact that the empty category is a nonpronominal in (1a) follows from the assumption that pronominal categories break the chain.[2] (If they did not, then control structures like (2b) would violate the θ-Criterion; the chain containing the antecedent of the pronominal and the pronominal itself would have two θ-positions.)[3] If the empty category in (1a) were taken to be a pronominal, then the chain containing its antecedent, the argument *Tom*, would have no θ-rule, violating the θ-Criterion. (If it is a nonpronominal, the structure is still excluded by the ECP.)

The empty category in (1b) cannot be a nonpronominal, since in that case it would form a chain with its antecedent, which would have two θ-positions, again violating the θ-Criterion. (The assumption that nonpronominal empty categories form a chain with their antecedent, at least when this is in A-position, is also independently motivated by NP-movement structures like (3a). Without this assumption (3a) would be analyzed as containing two chains, [Tom] and [e] – yet another θ-Criterion violation.)[4] This empty category cannot be a pronominal nonanaphor (pro), since it is not in an "identified" position (in the sense of Chomsky (1982)).[5] Moreover, as noted earlier, it cannot be a pronominal anaphor, since it is not ungoverned. Thus, the statements in (5) are not necessary to ensure that (la) and (1b) are excluded; nor are they necessary to ensure that the empty categories in (2)–(4) have the appropriate NP-type status.

The empty category in (2) is not nonpronominal, since it is in an ungoverned position and hence would violate the ECP. Again, it is not a pronominal nonanaphor, since it is not identified. Hence, it is a pronominal anaphor.

The empty categories in (3) and (4) are nonpronominal, since they are neither ungoverned nor identified. Furthermore, those in (3) must be anaphors: since they are A-bound, if they were nonanaphors then they would violate principle (C) of the binding theory.[6]

(6) *Binding Theory*
A. An anaphor is A-bound in its governing category.
B. A pronominal is A-free in its governing category.
C. A pronominal nonanaphor is A-free.

Finally, the empty category in (4) must be a nonanaphor (this incidentally does not follow from (5)), since it is governed but not A-bound. Taken as an anaphor, it would violate principle (A) of the binding theory.

These examples show that the conditions in (5) are largely redundant. Clearly, it would be methodologically best if they were fully redundant and could be eliminated from the grammar. I shall argue that the minimal hypothesis is in fact correct here – that the "contextual definitions" do not exist, and all their effects follow from other independently motivated principles. Indeed, I shall show that not only their effects but also the definitions themselves, at least in those respects in which they are correct, follow from independently necessary subsystems of grammar.

1.2. Complementary distribution and feature composition of empty categories

In LGB and in Chomsky (1982) the assumption that empty categories are characterized with the help of contextual conditions is contrasted with the position that empty categories differ inherently, in feature composition. Chomsky gives a directly empirical and a more conceptual argument against the latter claim.

The direct empirical argument is as follows. Agreement processes that suggest that PRO has features (person, number, etc.) behave in exactly the same way in constructions with traces. Thus, assuming that (7) (for example) involves an agreement requirement between the subject of the embedded clause and the postverbal NP makes it necessary to accept that PRO has number features. But the same assumption also leads to the conclusion that traces have number features, given the evidence in (8) and (9).

(7) a. Tom tried PRO to become a doctor
b. They tried PRO to become doctors
(8) a. Tom appears t to be a doctor
b. They appear t to be doctors
(9) a. Who does Tom believe t to be a doctor
b. Which men does Tom believe t to be doctors

The argument shows that traces share some features with PRO, if the assumption is granted that agreement in these cases really involves the empty category. But it

appears to have no bearing on the problem of whether trace and PRO differ in feature composition. Even though they may share some features, they may differ in others, just like lexical pronouns and anaphors. Still, even if the argument were valid that all empty categories have the same features, it would be irrelevant to the real issue: the question of the existence of NP-type definitions like (5).

The contrast between characterizing empty categories in terms of their feature content and classifying them by contextual conditions seems misleading to me. The issue here is not between contextual conditions and differences in feature composition. It is between the existence of the statements in (5) (or indeed of any condition that is motivated solely by the fact that it contributes to establishing a typology of empty categories) on the one hand and the lack of such stipulative conditions (that is, random characterization of empty categories constrained by independently motivated principles) on the other. Whether empty categories differ in feature composition is of tangential interest only. Both the negative and the positive answer to this question are compatible with both the existence and the nonexistence of contextual conditions in general and the statements in (5) in particular.

The main ("conceptual") argument for the existence of contextual definitions in LGB and in Chomsky (1982) is based on the complementary distribution between trace and PRO and their combined ability to appear in (almost) any NP position. Chomsky argues in LGB that these striking facts are explained if there is only one basic type of empty category. "PRO" and "trace" are then simply names of the various functions or occurrences in different contexts of what is always the same empty category. If contextual definitions exist and associate the names "PRO" and "trace" with the appropriate contexts, this makes it possible to maintain the assumption that there is only one basic empty NP, and thus to explain the appearance of complementary distribution and the fact that this empty category may appear in any NP position.

This argument involves two claims: first, that the assumption that there is only one basic type of empty category explains the phenomena of complementary distribution, and second, that this assumption entails the existence of contextual definitions.

Let us start with the latter point. In order to assume that there is only one basic type of empty category, it is not necessary to countenance contextual definitions (i.e. additional principles for identifying empty category types). Given independently necessary conditions on these types, random characterization of empty categories as +/− pronominal, +/− anaphor might do just as well. (This is essentially the same point that was just made: the issue is not between definitions and differences in feature composition but between definitions and the lack thereof – that is, random characterization.) Random characterization of empty categories does not entail the claim that there are feature differences between them; hence, definitions are not necessary in order to maintain that there is only one basic empty category with varying properties.

Furthermore, assuming that there is only one basic type of empty category does not explain the complementary distribution; it only pushes the problem to

a different level.[7] Instead of asking why the two kinds of empty categories – trace and PRO – are in complementary distribution, we must now ask why the two functions/occurrences of the same empty category are in complementary distribution.

In fact, the theory of LGB offers a nonexplanatory answer to this question. The complementary distribution of trace and PRO is due to the curious conspiracy between the ECP and the binding theory: the former restricts traces to governed positions, the latter restricts PRO to ungoverned positions. From this it appears that an approach that tries to explain the complementary distribution by deepening our understanding of the *concept* of PRO and trace is doomed to failure. For a genuine explanation we should look instead at the principles that induce the complementary distribution, trying to reformulate them in such a way that this phenomenon ceases to appear to be an accidental conspiracy. (See Brody (forthcoming) for such an attempt.)

I should also mention here the argument – implicit in Chomsky (1982) but often made explicitly – that the existence of derivations in which empty categories change their (+/− pronominal, +/− anaphor) status shows the necessity of contextual definitions. It seems unclear whether such derivations in fact exist – certainly the evidence adduced in favor of this hypothesis is unconvincing.[8] But it is important to note that the basic problem with this argument is not empirical but conceptual. Whether empty categories change status is irrelevant to the present problem. Suppose that such changes do take place. Then empty categories must be recharacterized at some or every level of the derivation. This says nothing about the method of characterization, which therefore need not involve definitions and can be random. (Of course it also says nothing about whether empty categories differ in feature composition.)

2. On variables

2.1. The definition of variables

Let us start our discussion of the redundancy of conditions (5a–c) with the definition of variables in (5b), repeated here:

(10) α is a variable iff α is locally $\bar{A}$-bound.

We might understand (10) as a principle of NP typology, as a principle of interpretation, or as both. If it is a principle of NP typology, then the notion of variable here is like that of PRO or trace – it is simply an abbreviation referring to certain NPs with a given feature composition, namely, to nonpronominal nonanaphor empty categories.[9] Thus, one way of understanding (10) is as an abbreviation of (11).

(11) α is a nonpronominal nonanaphor empty category iff α is locally $\bar{A}$-bound.

Another way of understanding (10) is to consider it as a principle of interpretation, as in (12),

(12) α is interpreted as a variable iff α is locally Ā-bound.

which says that locally Ā-bound categories, whatever NP-type they happen to belong to, are interpreted as variables. (10) may also mean the conjunction of (11) and (12).

Since our aim is to show that NP-type definitions do not exist, we must demonstrate that (10) should be understood only as a principle of interpretation, and not as (11). I shall argue that (11) is partly redundant and partly incorrect.

Consider (11) from left to right, as in (13).

(13) If α is a nonpronominal nonanaphor empty category, then α is locally Ā-bound.

(13) may be taken to contribute to the account of the ungrammaticality of structures with crossover violations, for example (14a), and of examples like (14b).

(14) a. *[Who$_x$ did] he$_x$ like e$_x$ (cf. *Who$_x$ t_x liked himself$_x$*)
b. *He$_x$ liked e$_y$

(14a,b) are excluded if the empty category in them is taken to be a pronominal, since it is neither ungoverned nor identified. If the empty category is a nonpronominal anaphor, then (14a) is excluded by the θ-Criterion (since the chain [he,e] contains two θ-positions), and (14b) by principle (A) of the binding theory (since it contains an anaphor that is not A-bound in its governing category). If the empty category in (14) is a nonpronominal nonanaphor, then (13) excludes the structure, since the empty category is not locally Ā-bound in it.

However, it is not necessary to appeal to (13) here. (14a) with a nonpronominal nonanaphor empty category is excluded by the θ-Criterion. Since all nonpronominal empty categories form a chain with their local A-binder, (14a) still contains the chain [he,e] to which two θ-roles are assigned. (14a) is now also excluded by principle (C) of the binding theory, since it contains an A-bound nonpronominal nonanaphor.

As for (14b), it has often been suggested in the literature that natural language grammar includes a – presumably interpretive – condition that excludes free variables. If we assume that nonpronominal nonanaphor empty categories are necessarily interpreted as variables, then this interpretive condition will entail (15).

(15) *The V-Element Condition (VEC)*

If α is a nonpronominal nonanaphor empty category, then α is bound.

Since being a nonpronominal nonanaphor empty category is not (as I shall soon argue) a necessary condition of being a variable, I use a different term for these categories – namely, *V-elements* – and call (15) the *V-Element Condition* (VEC).

The VEC immediately excludes (14b) if the unbound empty category in it is nonpronominal. In fact, (13) in general is a consequence of the VEC and principle (C) of the binding theory. Consider a nonpronominal nonanaphor empty category. By the VEC it must be bound, by principle (C) it must be A-free. Hence, such a category must be locally Ā-bound. Since this exhausts the full content of (13), (13) can be dispensed with.

Now consider (11) from right to left, that is, (16):

(16) If α is locally Ā-bound, then α is a nonpronominal nonanaphor empty category.

That locally Ā-bound categories must be empty excludes structures like (17a).

(17) a. *Who$_x$ did Tom see Mary$_x$
b. *Who$_x$ is it illegal e$_x$ to see Tom

This, however, is a natural result of the fact that categories with features not drawn from ϕ are overspecified to function as variables. Given (12), all locally Ā-bound categories are interpreted as variables, and a conflict results. The part of (16) stating that locally Ā-bound categories can only have ϕ-features is therefore redundant; the same result follows from principles of interpretation.

Condition (16) also states that locally Ā-bound elements must be nonpronominal nonanaphors. This restriction correctly appears to exclude the ungrammatical (17b). In (17b) the empty category cannot be nonpronominal (by the ECP), since it is ungoverned. (16) excludes (17b) if the empty category is taken to be a pronominal.

As (18) shows, however, there exist both Ā-bound pronominals and Ā-bound anaphors.[10]

(18) Who$_x$ did PRO$_x$ losing his$_x$ way annoy e$_x$

The first of the two empty categories here must clearly be a pronominal, since otherwise it would be excluded by the ECP; moreover, it must be an anaphor, since it is not identified as a pronominal nonanaphor would have to be. The claim that locally Ā-bound categories are all nonpronominal nonanaphors then appears to be false.

From this we may conclude that the definition of variables in (5b)/(10) should not be interpreted as an NP-type definition, i.e. (11).[11] Apart from making the false claim that locally Ā-bound categories are nonpronominal nonanaphors, (11) is in fact redundant.

It remains to account for the ungrammaticality of (17b). As (19) shows, PRO is nonreferential when it has a nonreferential antecedent.

(19) It$_x$ often rains without PRO$_x$ snowing

(The empty category in (19) must be a pronominal anaphor, since it is in an ungoverned, nonidentified position.) In (17b) PRO also has a nonreferential