THEMATIC SUPERIORITY AND ANAPHORIC BINDING*

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This article claims that the system of thematic structure determines the structural relation between an anaphor and its antecedent and the local domain in which the relation of anaphoric binding may take place. For the structural relation, we will propose the notion of θ -SUPERIORITY, which represents the relative 'prominence' of a node in terms of thematic structure. The local domain for anaphoric binding will be shown to be the THEMATIC DOMAIN, which is a minimal category containing a θ -assigner and its arguments. This line of analysis will be compared with the 'configurational' theory of anaphoric binding which is based on such configurational notions as *c-COMMAND* and ACCESSIBILITY, and some problems with this latter approach will be discussed.

1. INTRODUCTION. '*C-COMMAND*', originally due to Reinhart 1976 and later revised by Aoun & Sportiche 1981, is one way of measuring the relative prominence of a node in a given syntactic tree: a *c-commanding* node is more prominent than a node that is *c-commanded* by that node, since the former is 'higher' in the sense that it is nearer the root of the tree than the *c-commanded* node and not conversely. This notion, *c-command*, plays an essential role in a standard approach to anaphoric binding, such as that found in the literature in the Government and Binding (GB) framework.¹ 'Binding Principle A', which is of direct relevance to our discussion, is the following.¹

(1) An anaphor is bound in its governing category.

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¹ For a comprehensive outline of the GB framework, cf. Chomsky 1981, 1982. As for the notion of *binds*, Chomsky 1981:184ff. develops a more general idea of *X-binding*, which applies not only to the binding relations between elements in argument positions, but also between an element in an argument position and a so-called operator position. For the 'Binding Principles', cf. Chomsky 1981:188.

The notion of *binds*, in the GB tradition, is defined as in the following.¹

(2) $X \text{ BINDS } Y$ iff X *c*-commands Y and X is coindexed with Y .

Thus, given two nodes, one binding the other, it is the more prominent one that is the binder, and the bindee is the less prominent one in configurational terms, construed in the sense noted above. In a relation of anaphoric binding, then, the antecedent should be configurationally more prominent than the anaphor that it binds, and so forth.²

In this paper, I am going to outline a theory of anaphoric binding which has as its basis a different kind of notion than *c*-command. The claim to be made is that what is crucially involved in the theory of anaphoric binding must be more thematic in nature than configurational, and that the theory has to have some way of expressing the idea of relative 'prominence' of a given node (or 'argument') in thematic structure.³

There have been similar proposals in the literature: Jackendoff's 1972 theory of anaphoric binding incorporates what he calls Thematic Hierarchy, but, overall, his analysis is based on a configurational notion (a revised version of *command*, which is more or less identical with *kommand* in Lasnik's 1976 sense), and he makes use of a thematic constraint only for those cases where configurational accounts fail. Koster 1978 has a similar idea based on grammatical relations, which is easily reinterpretable in thematic terms, but, again, he invokes this idea essentially as an auxiliary device.

In Section 2, we will point out some problems with a theory of anaphoric binding which has recourse to *c*-command and its various definitions, and compare this with our theory, which invokes the idea of THEMATIC SUPERIORITY, with some elaboration. In Section 3, we will focus our attention on the issue of locality in syntactic theory, comparing the two proposals, one having recourse to configurational notions such as *c*-command and accessibility, and the other based on the notion THEMATIC DOMAIN. Some further issues will be briefly discussed in the concluding section.

2. C-COMMAND VS. θ -SUPERIORITY. The configurational notion *c*-

² See Koster 1981 for this line of idea.

³ The theory of thematic relations was first formulated by Gruber 1965 and was developed by Jackendoff 1972.

command has not been accorded a unique interpretation, and there have been at least two definitions of this notion which are equally well-known in the literature, each having its virtues and shortcomings. We quote the two definitions here:

- (3) C-COMMAND (Reinhart 1976):

X c-COMMANDS Y iff the first branching node dominating X also dominates Y .

- (4) C-COMMAND (Aoun & Sportiche 1981, hereafter AS):

X c-COMMANDS Y iff every maximal projection [in the sense of X-bar theory] dominating X also dominates Y .

As is apparent, the Reinhart version is simply sensitive to the branchingness of given nodes (with important qualifications) while the AS version refers to the X-bar theoretic notion of *maximal projection*.⁴ These two definitions give rise to different predictions for cases of anaphoric binding such as these:

- (5) a. the artists' portraits of each other
b. *each other's portraits of the artists

On the assumption that this type of nominal construction is of the following structure:⁵

The Reinhart definition correctly predicts the contrast in 5, since according to this, the position occupied by X asymmetrically c-commands the position of Y — X c-commands Y , for the first branching node dominating it, viz. NP° , dominates Y as well. Y does not c-command X , for the first branching node dominating Y is PP , or if it does not count, N' , and neither PP nor N' dominates X . Thus, the Reinhart

⁴ There are some qualifications for the Reinhart definition of c-command: in a configuration created by Chomsky-adjunction, for example, where a node immediately dominates another node of the same type, the lower of the two nodes is not taken as a branching node relevant for c-command. This qualification applies to the AS definition as well.

⁵ The *of*-phrase here may not be a PP —it might be adjoined to the NP governed by the head N , the resulting structure being [NP of NP]. For the conditions governing the occurrence of *of* in these environments, cf. Williams 1981.

version of *c*-command correctly excludes an anaphoric relation with an anaphor in the position of *X* and its antecedent in *Y* in structure 6. On the other hand, the AS definition predicts that either of 5a and 5b should be well-formed, since, on this definition, the positions occupied by *X* and *Y* *c*-command each other—the only maximal projection dominating *X* and *Y* being NP^o. Notice that the presence of PP dominating *Y* and not *X* does not help here, since AS exclude PPs headed by *of* from possible barriers for *c*-command (and hence for government, since they assume that an NP in *of*-phrase is governed by the head N). Since *X* and *Y* mutually *c*-command, the prediction should be that either position may be occupied by an anaphor being bound by the antecedent that occurs in the other position.

The thematic principle for anaphoric binding that I am going to put forth is the following.

- (7) An anaphor may not be THEMATICALLY SUPERIOR (θ -SUPERIOR) to its antecedent.

The notion of θ -SUPERIORITY is the basis for measuring the relative prominence of nodes in a tree in thematic terms. Roughly speaking, a node is θ -superior to another if it bears a θ -role that is higher than that assigned to the other in terms of the Thematic Hierarchy, originally formulated by Jackendoff 1972, although it is not our intention to merely follow it.⁶

- (8) THEMATIC HIERARCHY (TH):

1. Agent > 2. Source, Goal, etc. > 3. Theme

Jackendoff himself does not attempt to explain why θ -roles should be ordered in this way rather than, say, the other way round. However, if we think of the situation from the perspective provided by the recent literature on thematic structure (e.g. Williams 1981), the TH ceases to be just an arbitrary arrangement of things. In a fair number of cases, Theme is realized by an argument which is expressed most internally, i.e. an argument that is governed by a θ -assigner of category X⁰. The θ -role of Agent is typically assigned to an argument that appears external to a predicate expression (such as VP): an argument that is governed by the entire predicate expression headed by a θ -assigner. Such 'oblique' arguments as Goal and Source are in between: they are typically expressed within a predicate expression, such as VP, but are often

⁶ Jackendoff's restriction is that an anaphor may not be bound by an NP lower than it in terms of the TH.

realized by an argument within PP and not directly governed by the head X^0 . In this sense, Goal and Source are less external than Agent and less internal than Theme.⁷ Certainly, this characterization of thematic structure does not work for a number of cases—one might easily enumerate such cases as double object (or ‘dative’) constructions, ‘privative’ constructions (those involving *deprive* etc.), middle constructions (cf. Keyser & Roeper 1984), etc. as counterexamples. But one could still argue that the above characterization of thematic structure constitutes the unmarked case: given a fully articulated theory of thematic structure, those apparently problematic cases will be dealt with in a certain systematic way. Viewed in this way, then, Jackendoff’s hierarchy of θ -roles is nothing but a spectrum of externality/internality of θ -roles in what we might call the unmarked cases. The idea, then, boils down to this: an anaphor may not be more external than its antecedent in terms of θ -role assignment. The definition of θ -superiority will be the following.

- (9) An argument X is θ -SUPERIOR to an argument Y in D , D a thematic domain, iff X is assigned a θ -role θ_i and Y is assigned θ_j , where θ_i is inherently more external than θ_j .

One important point about this line of approach is that one can speak of θ -superiority only with respect to arguments which occur in the identical THEMATIC DOMAIN (θ -DOMAIN), originally formulated in Nishigauchi 1984.⁸ This has an important implication for the issue of locality, which we will discuss in greater detail later on—the well-known fact that anaphoric relations can hold only in locally delimited domain is just a natural consequence of this requirement on θ -superiority.

Returning to the structure illustrated in 6 above, this line of approach offers an unequivocal characterization of anaphoric relations that can occur in this type of structure. The position occupied by Y is assigned the θ -role of Theme, which is, on our assumption, the most internal θ -role,

⁷ Actually, for Williams 1980, 1981, 1983, the notions ‘external/internal’ are not used as relative notions as in the present theory: for Williams, an argument is external if it occurs in a position that c -commands and is c -superjacent to (and hence ‘external’ to) a predicate expression, which he assumes must be a maximal projection of any category that is capable of assigning θ -roles; everything that occurs within the predicate expression being an internal argument. Therefore, he does not speak of one argument as being ‘more external/internal’ than another.

⁸ A θ -domain is a minimal category that contains a θ -assigner and its arguments.

being governed by the head N *portrait*.⁹ The position occupied by *X* is assigned the θ -role of Agent, which is most external. Thus, the position of *X* is θ -superior to the position of *Y*. Therefore, we expect that, if there is a relation of anaphoric binding with respect to these two positions, the anaphor must occur in the position *Y*, and its antecedent in *X*, in accordance with the contrast observed in 5.

Although the Reinhart version of *c*-command offers a prediction identical with the present theory for the structure illustrated in 5, the binding relations observed in the following sentences provide a basis for choosing between the two types of approach.

- (10) a. They talked to Mary₂ about herself₂.
 b. *They talked to herself₂ about Mary₂.
- (11) a. *They talked about Mary₂ to herself₂.
 b. ?They talked about herself₂ to Mary₂.

Given the standard definition of *binds* in GB, viz. 2, the well-formed examples 10a and 11b must be excluded (at least from the 'core grammar'), since, given any definition of *c*-command, neither *X* nor *Y* *c*-commands the other in the relevant structure:

- (12) a. talk to *X* about *Y* b. talk about *Y* to *X*

This is because *X* and *Y* are contained in distinct PPs. One way of avoiding this consequence might be to exclude PPs from the class of maximal projections and/or branching nodes relevant to the definition of *c*-command. This move will allow either version of *c*-command to incorporate the examples 10a and 11b, but then this theory will blindly rule in the ill-formed examples 10b and 11a since, on this assumption, *X* and *Y* mutually *c*-command in the structure 12. Just looking at the examples in 10 one might be tempted to invoke word order as a relevant factor, since in the well-formed 10a the antecedent precedes the anaphor, and in the ill-formed 10b the order is reversed. But this line of approach immediately collapses when faced with the examples in 11—such a theory cannot account for the fact that 11b is significantly better than 11a. (I concede, though, that word order is responsible for the fact that 11b is not impeccable, perhaps for performance reasons.) Thus, it should be clear from these considerations that no structural account is able to capture the range of data presented in 10–11.

On the other hand, in light of the examples in 10–11, one will notice

⁹ The idea here is that an object that is depicted in a portrait is what undergoes some kind of activity, and is characterized as Theme. Cf. Milner 1982.

that, in either of the well-formed sentences 10a and 11b, the anaphor is contained in the PP headed by *about*, and the antecedent in the PP headed by *to*. This suggests that what is in effect in the range of data under consideration is thematic in nature, since PPs headed by a specific preposition are normally associated with a certain θ -role.¹⁰ Applied to the structures in 12, the NP contained in the *about*-phrase will be associated with the θ -role of Theme and that contained in the *to*-phrase will be Goal: the thematic structure of the predicate expression (VP) induced by the head *talk* can be characterized in such a way that the information concerning the referent of the *about*-phrase is what undergoes transition (Theme), and this information is transferred to the referent of the NP in the *to*-phrase (Goal). Since, according to the above discussion, the argument in the *to*-phrase is more external than that in the *about*-phrase in terms of thematic structure and hence the former is θ -superior to the latter, the present theory expects that in order for an anaphoric binding relation to hold within a VP whose head is *talk*, the anaphor should appear in the position in the *about*-phrase, and its antecedent in the *to*-phrase.

There is further evidence for the Themehood of the NP occurring in the *about*-phrase in the VP involving *talk*, besides the semantic criterion mentioned above.

Wasow 1977 points out, as one criterion for lexical passives (as opposed to transformationally derived passives), that only lexically derived passive participials can occur in the prenominal position:¹¹

- (13) a. The box is broken. (lexical passive)
- b. a broken box
- (14) a. The man is believed to be sick. (transformational passive)
- b. *a believed man to be sick

One interesting point about this process noted by Wasow is that the noun to be modified by the passive participial in the prenominal position must bear the relation of Theme with respect to the verb from which the participial is derived—in the well-formed 13b, *box* is Theme of the verb

¹⁰ I am assuming here that it is not the preposition itself that assigns a θ -role to the NP that it governs; rather, θ -role assignment here must be done compositionally by the head of VP and the head of PP that it governs. For this line of idea, cf. Stowell 1980.

¹¹ Actually, Wasow's analysis is based on grammatical relations, and he invokes these diagnostics to identify direct objects. His analysis has been reformulated by Anderson 1977 in terms of thematic relations. I adopt this latter formulation in this paper, but the insight of this line of idea must still be ascribed to Wasow.

break. The following paradigm indicates this point.

- (15) a. He often told *the children a story*.

Goal Theme

- b. an oft-told story c. *an oft-told child

Since *child* is Goal, and not Theme, with respect to *tell*, 15c is ill-formed. Now, the argument that appears in the *about*-phrase of the *talk*-environment passes this test.

(16) the most talked about player (in the team) [from Wasow's 90]
This can be taken as a morphological piece of evidence that the argument in the *about*-phrase of the VP headed by *talk* has the θ -role of Theme. The argument in the *to*-phrase, of course, fails this test.¹²

- (17) *an easily talked to man

Nominal constructions headed by *letter*, e.g., appear to parallel the VP with *talk* both syntactically and thematically.

- (18) a. a letter about *X* to *Y* b. a letter to *Y* about *X*

In this structure, the argument in the *about*-phrase is Theme, and that in the *to*-phrase is Goal. Thus, since, on our assumption, the latter, the position *Y* in 18 is θ -superior to the position *X*, the present theory predicts that, for a relation of anaphoric binding to hold in this type of NP, the anaphor should appear in the position *X* and its antecedent in the position *Y*. That this prediction is borne out is shown by the following range of data.¹³

- (19) a. a letter to John₂ about himself₂

- b. *a letter to himself₂ about John₂

- (20) a. *a letter about John₂ to himself₂

- b. ?a letter about himself₂ to John₂

Notice, again, that the standard approach based on configurational notions is unable to account for the above facts, since, given any definition of *c*-command, the structural relation between *X* and *Y* in 18 must be described in such a way either that neither *c*-commands the

¹² Notice that the passive of *talk to* (which, on Wasow's analysis, must be a case of transformational passive) is permissible:

(i) He was talked to by many people at the conference.

¹³ Some speakers of English might accept the starred examples in 19–20, but such speakers tend to pronounce these sentences with stress on the reflexives. This can be taken as indicating that the speakers in question are interpreting the reflexives in these sentences as emphatic elements rather than as anaphoric items. I am indebted to David Lebeaux (p.c.) for this observation. This point appears to hold for the judgement of 21 below as well.

other (if PPs count as barriers) or that they mutually *c*-command (if PPs don't count).

The contrast in grammaticality as seen in the following nominal constructions provides another basis for choosing between the two types of approach under consideration.¹⁴

- (21) a. a picture of himself₂ by Rockwell₂
 b. *a picture of Rockwell₂ by himself₂

In terms of the thematic structure, the argument in the *of*-phrase is directly governed by the head N *picture* and is assigned the θ -role of Theme—the most internal argument on our assumption. On the other hand, the argument in the *by*-phrase has the θ -role of Agent, which is the most external θ -role. Since the latter is θ -superior to the former, the present analysis predicts that the anaphor should occur in the *of*-phrase and its antecedent in the *by*-phrase, in order for an anaphoric relation in this construction to be well-formed. This is in keeping with the pattern observed in 21.

It is worth emphasizing here that a configurational approach based on the AS-definition of *c*-command offers a prediction directly opposite to the one made by the thematic theory for the type of construction exemplified in 21. To see this, consider the syntactic tree for this type of NP.¹⁵

Recall that AS assume that PPs headed by *of* in this type of structure do not count as maximal projections while PPs headed by *by* do count. Thus, the only maximal projection node dominating *X* is the topmost NP

¹⁴ Precedence relation is off the wall here, since the order of the two PPs relevant here is rigidly fixed, independent of binding relations.

(i) a picture of Mary by Rockwell

(ii) *a picture by Rockwell of Mary

This must be due to the requirement on the occurrence of the *of*-phrase in these environments: it must appear in the position governed by the head N.

¹⁵ I am tentatively assuming here that the maximal number of bars in English is three ($X^{max}=X'''$), although nothing in the present discussion crucially hinges on this assumption.

which dominates *Y* as well. The argument *Y*, on the other hand, is dominated by the *by*-PP, which does count as maximal projection, and this latter PP does not dominate *X*. Therefore, *X* *c*-commands *Y* and not conversely. This leads us to expect that 21b, and not 21a, will be acceptable, which is contrary to the fact. The Reinhart definition of *c*-command is of no help either, since it simply says that, in the structure 21, neither of *X* and *Y* *c*-commands the other, for they are dominated by two distinct branching nodes—*X* by the *of*-PP or by *N'* and *Y* by the *by*-phrase—neither of which dominates the other. So, again, we see that no theory based purely on the configurational notion of *c*-command can capture the subtle contrast in 21, while the thematic approach being developed in this article can offer a straightforward account of it.¹⁶

It must be acknowledged that the present theory, as it is formulated thus far, offers a false prediction that the binding relation in 22a should be well-formed.¹⁷

(22) a. *[each other]₂'s portraits by [the artists]₂

This is because the argument in the DET position of NP may be associated with the θ -role of Theme, which, on our assumption, is most internal, and hence should be able to be bound by an NP in the *by*-phrase, which is Agent, and is θ -superior. Since 22a is ill-formed, as it is formulated so far, this would be a problem for the present theory.

On the other hand, it should be observed that the present theory correctly predicts the low acceptability of 22b, which is structurally parallel with 22a, with the order of the anaphor and its antecedent reversed.

(22) b. ??[the artists']₂ portraits by [each other]₂

The explanation for this will be essentially the same as that for the ill-formedness of 21b. Notice again that this is a serious problem for configurational theories based on *c*-command, since the putative antecedent in the DET position *c*-commands the anaphor in the *by*-phrase, under any definition of *c*-command. Therefore, the configura-

¹⁶ Part of the motivation for the AS definition of *c*-command is that they wish to exclude PRO, an empty category which may not be governed, from appearing in the DET position of an NP; thus, *[_{NP} PRO [_{N'} books]] can be ruled out given their definition of government which derives from the AS *c*-command, since, on this definition, PRO is *c*-commanded and is governed by the head N.

¹⁷ This problem has been pointed out by a reviewer for ENGLISH LINGUISTICS.

tional approach clearly predicts that 22b should be well-formed, which is false.¹⁸

The ill-formedness of 22a indicates that something more needs to be said about the DET position of NP—or the subject position in general. The idea that is presumably in effect here is that, although the argument that occupies the DET position may be associated with Theme, which is itself inherently internal, the position must be somehow marked in such a way that anything that occupies that position behaves as an external argument.

One way of expressing this idea may lie along the line of Williams 1982, who suggests that the DET position of NP is non-thematic in the sense that the relation that it may bear to the rest of NP (N' or N'') may be in general quite arbitrary. Cf. his 'Det Rule', which simply states this point. The argument in the DET position, thus, may be assigned any θ -role as long as it is semantically compatible with the rest of the domain.¹⁹ Theme may be assigned to this position, as in *the city's destruction (by the enemy)*, but this typically happens when Theme has not been realized elsewhere in the NP—this is presumably due to the requirement on thematic structure, which is that every thematic domain must contain a

¹⁸ One possible account in the traditional transformational approach might be to account for the ill-formedness of 22b by invoking the 'Crossover Principle' in the sense of Postal 1971 plus the theory of NP structure of Chomsky 1970. That is, if one assumes that the underlying structure for 22b is something like (i):

(i) [_{DET} X(s)] portraits (of) [the artists] by [e]

where *X* in the DET position is moved to the position in the *by*-phrase ('Agent Postposing') and the NP *the artists* is moved to the now vacated DET position ('Object Preposing'). This derivation involves the crossing over of the coreferential NPs, in violation of the above-mentioned constraint.

However, as is well-known, at least the 'Agent Postposing' part of the above analysis has been refuted, e.g. by Fiengo 1977, and this latter view has been accepted in the current literature. Along this line, then, the source structure for 22b would be (ii), rather than (i).

(ii) [_{DET} e] portraits (of) [the artists] by [X]

If this line of analysis is adopted, the above account will not work, for no violation of the Crossover Principle is involved in the derivation of 22b from (ii). Williams 1982 argues that NP is not a domain for NP-Movement, so that even the 'Object Preposing' part of the transformational derivation must be abandoned.

¹⁹ Notice that the DET position is not even specified for Agent: one can have *yesterday's destruction of Rome* (Hornstein 1977), for instance. Furthermore, *you* as in *your destruction of Rome* does not have to be Agent: it could mean something like 'the destruction of Rome that you just mentioned'. For similar examples, cf. Williams 1982.

Theme argument (cf. Anderson 1977). The point here, thus, is that, although the anaphor in the DET position in 22a may have the θ -role of Theme, this position is clearly not specified in such a way that it must be assigned a particular θ -role as a lexical property of the head N. The generalization appears to be this: X may be θ -superior to Y just in case Y is in a thematic position, where a *thematic position*, in our sense, is a position that is specified so that a specific θ -role is assigned to it.

This line of approach to anaphoric binding naturally extends to a theory of locality, a central issue in current linguistic theory.

Notice that, given the way the notion of θ -superiority is defined in (9), one can speak of θ -superiority of arguments only within a θ -domain. That is to say, in order for one argument to be θ -superior to another, the two arguments have to be assigned their θ -roles by the same θ -assigner. The relation of θ -superiority can never hold between arguments of distinct θ -domains (with important qualifications to be discussed shortly). This point accounts for the 'local' nature of anaphoric binding: once there is an argument θ -superior to the anaphor in a given θ -domain, nothing outside that θ -domain can be the antecedent for the anaphor—this is because nothing outside the θ -domain can be θ -superior to the anaphor. The effect of the Specified Subject Condition (first formulated by Chomsky 1973: hereafter SSC), as in the following, falls into our theory in this way.

(23) *Mary₂ saw [_{NP} Rockwell's picture of herself₂]

The NP in the DET position of the *picture*-NP has the θ -role of Agent and is θ -superior to the anaphor, which appears in the position that is associated with Theme. Once this relation is established, nothing outside the θ -domain, viz. the *picture*-NP, can be θ -superior to the anaphor—since *Mary* cannot be θ -superior to the anaphor, the anaphoric relation indicated in 23 is ill-formed. Of course, the binding relation in 23 can be excluded by the SSC and the binding theory of GB as well. However, the ill-formedness of the following sentence provides a basis for choosing between the configurational theories and the thematic theory.

(24) ?*Mary₂ saw [_{NP*} the picture of herself₂ by Rockwell]

In this sentence, NP* cannot be a governing category—a local domain for binding, which is defined as follows.

(25) GOVERNING CATEGORY: Y is a GOVERNING CATEGORY for X iff Y is the minimal category containing (i) X ; (ii) a governor of X ; and (iii) a SUBJECT ACCESSIBLE to X .

Given this, the question to be asked is whether the NP *Rockwell* can be a SUBJECT accessible to the anaphor in 24, a necessary condition for NP* to count as a governing category. The answer is clearly no, since, for Z to be accessible to X, Z must *c-command* X, as one requirement for this notion.²⁰ The NP *Rockwell* does not *c-command* the anaphor under any definition of *c-command*, and nothing else can serve as an accessible SUBJECT for the anaphor in NP*. Therefore, the prediction made by the binding theory of GB is that the anaphor should be bound by something outside NP*, for NP* is not a governing category, and that 24 should be well-formed, which is false.

In the present analysis, the ill-formedness of 24 is accounted for in the same way 23 is excluded: the NP *Rockwell* in NP* has the θ -role of Agent and is θ -superior to the anaphor. Once there is such a relation in NP*, nothing outside NP* may be θ -superior to, and hence bind, the anaphor in NP*. It is easy to see, further, that 26 should be acceptable under the present account, where the binding relation holds within NP*, a θ -domain for the anaphor.

(26) Mary saw [_{NP*} the picture of himself₂ by Rockwell₂]

That this is a problem for configurational accounts should be clear by now—cf. 21–22 and the discussion thereof.

However, the following, familiar sentences suggest that our account of anaphoric binding is too strong—in a large number of cases, an anaphor that occurs within a *picture*-NP, which I take to be a θ -domain, finds its antecedent outside that domain.

(27) a. Mary₂ saw [_{NP} a picture of herself₂]

b. John₂ gave Mary₃ [_{NP} a picture of $\left\{ \begin{array}{l} \text{himself}_2 \\ \text{herself}_3 \end{array} \right\}$]

What distinguishes all these cases from the cases that we considered above is that, in 27, there is no external argument within the θ -domain in which the anaphor appears. So, the generalization here seems to be this: first, look for a θ -superior argument within the θ -domain in which you find the anaphor—if this search fails, look outside.

Now, let us say that if a θ -domain contains an argument which is 'sufficiently external' (to be made precise shortly), it is THEMATICALLY CLOSED (θ -CLOSED); otherwise, it is θ -OPEN. Then we could present the following provision for the notion of θ -superiority:

(28) If X is θ -superior to D, D a θ -domain, then X is θ -superior to

²⁰ We will turn to a more detailed discussion of accessibility later on. Cf. 33 below.

Y , where Y is an argument of D , and D is θ -open.

Applied to the above case, 27, the *picture*-NPs are θ -open, since neither contains an argument θ -superior to the anaphor. Therefore, any NP that is θ -superior to the *picture*-NP may be θ -superior to the anaphor within it, given the provision 28. That the relation of θ -superiority may hold in an unbounded fashion under restricted conditions can be shown by examples like this:

- (29) Max₂ wrote [a review of [an article on [a book about [a picture of himself₂]]]]

Given the provision 28, a next question to ask is: what kind of argument is 'sufficiently external' to make a θ -domain closed? Facts like 23–24, first of all, indicate that Agent is sufficiently external. This will be natural, since, Agent is, on our assumption, the most external θ -role that is available in the hierarchy 8. What about 'oblique' arguments, such as Goal, Source, etc.? The following sentences indicate that these 'oblique' arguments do not act as barrier for binding from outside.

- (30) a. John₂ found [_{NP} a letter about himself₂ $\left\{ \begin{smallmatrix} \text{from} \\ \text{to} \end{smallmatrix} \right\}$ Mary]
 b. John₂ found [_{NP} a letter $\left\{ \begin{smallmatrix} \text{from} \\ \text{to} \end{smallmatrix} \right\}$ Mary about himself₂]

This suggests that Agent has a special status in the sense that its assignment has the property of delimiting a local domain for anaphoric binding—in our terms, then, the assignment of Agent, and no other θ -role, makes a θ -domain closed.

At this point, it is not clear why Agent has such a unique status. One possible account may lie in the line of analysis of θ -role assignment explored by Muysken 1983, where it is argued that θ -role assignment proceeds from bottom up in a cyclic fashion and that θ -roles are 'extrinsically ordered' in such a way that, within a cycle, Theme is assigned first to an argument governed by the head θ -assigner, oblique arguments such as Source and Goal (which are lexically specified) are assigned next, and Agent is assigned finally on that cycle. Given this line of idea, one might say that a θ -domain that contains an argument that has been assigned Agent has in some sense 'exhausted' the inventory of possible θ -roles that can be assigned on that cycle, so that once this point has been passed θ -role assignment automatically proceeds to a higher cycle. In this sense, a θ -domain with Agent is 'complete' in terms of thematic structure and one lacking Agent is not. This completeness of thematic structure must be a factor that contributes to the closedness of

θ -domains, but a full account of this notion must await a more articulated theory of θ -role assignment.²¹

3. LOCAL AND NONLOCAL ANAPHORIC BINDING. We have seen thus far that the antecedent for an anaphor must be θ -superior to the anaphor if they appear in the same θ -domain, and across θ -domains, the antecedent for the anaphor must be θ -superior to the θ -domain that contains the anaphor—for this latter type of anaphoric binding to hold, the θ -domain containing the anaphor must be θ -open, i.e. it must lack the external argument, viz. Agent. I am going to show in this section that these constitute the core cases of anaphoric binding—the cases where anaphoric binding is in complementary distribution to pronominal indexing. If no element is available that is θ -superior to the anaphor within the θ -domain, any NP, in principle, can be the antecedent for that anaphor as long as the anaphor is not θ -superior to that NP. Thus, given the way the theory of anaphoric binding is presented in 7, the following two sets of cases of binding will be allowed.

- (31) A. The antecedent is θ -superior to the anaphor.
 B. Neither the anaphor nor its antecedent is θ -superior to the other.

The illicit case is that where the anaphor is θ -superior to its antecedent. Case A is that where anaphoric binding is in complementary distribution to pronominal indexing, Case B being that where anaphors and pronominals may be interchangeable (modulo the subtle semantic factors discussed by Cantrall 1974).²² This situation arises because the condition on pronominal indexing in English largely overlaps with

²¹ The contrast as seen in these two expressions involving the lexical item *control* may be relevant to the present discussion: (a) *X is in control of Y*; (b) *X is in the control of Y*. In a, *X* is the controller (Agent), and *Y* the controllee (Theme); in b, the 'control relation' is reversed. Now, consider:

- (i) John₂ is in control of himself₂.
 (ii) *John₂ is in the control of himself₂.

At the descriptive level, the contrast in these sentences fits in with the present theory—in (i) the binding relation is fine because the antecedent is Agent and the anaphor is Theme, and thus the former is θ -superior to the latter. In (ii) the thematic structure is reversed, and the anaphoric relation is accordingly ill-formed. But how this idea can be made explicit in the theory is beyond the scope of the present work.

²² One important distinction between anaphoric binding and pronominal indexing must be drawn on the basis of the effect of the Tensed S Condition (Chomsky 1973), which only the former obeys.

31B—I assume that the conditions on pronominal indexing include the requirement based on θ -domains, viz. that pronouns and their antecedents must occur in distinct θ -domains, which implies that neither a pronoun nor its antecedent may be θ -superior to the other. This latter in turn implies the situation described in 31B.

The distinction in 31 is essentially paralleled by Lebeaux's 1982 discussion of local and nonlocal anaphoric binding—local binding is Case A, nonlocal binding being Case B, essentially.

With this much background, we will consider the properties of sentences like the following.

- (32) a. John₂ thinks [that [pictures of himself₂] would win the prize]
 b. [Those pictures of himself₂] would upset John₂.

The binding theory of GB treats these sentences in quite different ways. The anaphoric binding relation in 32b is excluded by the Binding Principle A (cf. 1 above), since the object of *upset* does not *c*-command the anaphor that occurs within the subject under any definition of *c*-command. The well-formedness of this sentence, then, would have to be accounted for, perhaps invoking the theory of markedness in some fashion.

The status of 32a, on the other hand, is quite different, given the GB binding theory. The complement clause of this sentence does not serve as the governing category for the anaphor, because this clause does not contain a SUBJECT accessible to it. To see this, let us see how the notion of 'accessibility' is defined.

- (33) ACCESSIBILITY: *X* is ACCESSIBLE to *Y* iff
 (i) *X* *c*-commands *Y*; and
 (ii) the assignment of the index of *X* to *Y* does not violate the *i*-INSIDE-*i* CONDITION.

The complement clause of 32a, to be more specific, is of the following structure.

- (32) a'. ... that [_S^o [_{NP*} pictures of himself₂]₂ AGR₂ would ...]

In this complement the candidate for the SUBJECT accessible to the anaphor is AGR, since the clause is tensed.²³ The subject, viz. NP* is coindexed with AGR by predication.²⁴ Now, if we assign the index of

²³ Recall that SUBJECT means the subject of a tenseless clause or NP and AGR of a tensed clause.

²⁴ Cf. Chomsky 1981:211.

AGR to the anaphor by 33ii, the anaphor bears the index which is identical with the one assigned to the NP immediately containing it, viz. NP*—a configuration barred by the *i*-inside-*i* condition.²⁵ Therefore, AGR is not accessible to the anaphor. Since the complement clause S° does not contain a SUBJECT accessible to the anaphor, S° is not a governing category for the anaphor. The governing category for the anaphor, instead, must be the entire sentence because the matrix clause, being tensed, does contain an AGR, an accessible SUBJECT. Since the anaphor is bound in its governing category, the anaphoric relation in 32a clearly falls within the domain of the Binding Principle A (1), and hence must be considered as a case of local anaphoric binding.²⁶

However, the following diagnostics, discussed by Lebeaux 1982 (and also by Nishigauchi 1984 for cases of control), indicate that the anaphoric relations in 32a and 32b share the same status and that the properties associated with the kind of binding exhibited in these sentences are quite different from the properties of local binding, where the antecedent is θ -superior to the anaphor.²⁷

First, the binding relation is not uniquely determined in sentences like the following.

- (34) John₂ thinks [_S, that [this picture of $\left\{ \begin{smallmatrix} \text{himself}_2 \\ \text{herself}_3 \end{smallmatrix} \right\}$] would upset Mary₃]

This sentence contains both the types of binding relations exhibited in 32. If the type of binding as seen in 32a were a core case of anaphoric binding and the type of binding in 32b were somehow marked, as would be dictated by the binding theory of GB, we should expect that the binding from the main clause subject, viz. *John* would predominate, so that the binding from within the embedded clause, viz. by *Mary*, would be obliterated. This we expect because in sentences like this:

²⁵ The motivation for this constraint, which is ascribed to J.-R. Vergnaud, is illustrated by sentences like the following.

(i) *John saw [a picture of itself]₂

For related discussion, cf. Williams 1982.

²⁶ Yang 1983 reports that a Russian sentence analogous to 32a is ungrammatical.

²⁷ Some of the problems with GB to be discussed here have been pointed out elsewhere: cf. Lebeaux 1982, Hasegawa 1983. Also, Nishigauchi 1984 discusses the issue of locality for control relations from a perspective of the line of analysis developed in the present paper.

- (35) [This picture of {himself₂
*herself₃} by Rockwell₂] will upset Mary₃.

the presence of an NP *Rockwell* within the θ -domain for the anaphor blocks the binding from outside; the binding by *Mary* is impossible. This means that the presence of a local binder precludes nonlocal binding. The fact that neither of the two candidates for the binder in 34 precludes the binding by the other indicates that the two types of binding involved in 34 are of the same status—both of them must be a case of nonlocal binding.

Second, and related to the first, an anaphor can be bound by split antecedents only when neither (or none) of the possible antecedents is θ -superior to that anaphor.

- (36) a. John₂ told Mary₃ [that [this picture of themselves_{2,3}] would win the prize]
b. John₂ thinks [that [this picture of themselves_{2,3}] will upset Mary₃]

Again, this is impossible if there is a candidate for the binder that is θ -superior to the anaphor.

- (37) a. *John₂ thinks [that Mary₃ will like [this picture of themselves_{2,3}]]
b. *Mary₂ thinks [that [this picture of themselves_{2,3} by Rockwell₃] will win the prize]

Notice further that binding by split antecedents is disallowed if both the candidates for the binder were θ -superior to the anaphor—that is, binding by split antecedents cannot take place within a local domain.

- (38) a. *John₂ talked to Mary₃ about [this picture of themselves_{2,3}]
b. *[This letter from Mary₂ to John₃ about themselves_{2,3}] was discovered.

Thus, the phenomenon of split antecedents observed in 36 shows not only that the binding relations exemplified in 32 are of the same status—it indicates that both of them are a case of nonlocal binding.

Third, and most seriously damaging to the binding theory of GB, in the constructions exemplified by 32a and 32b, anaphors can be in free variation with pronominals, so that either of the following sentences is grammatical.

- (39) a. John₂ thinks [that [pictures of him₂] would win the prize].
b. [Those pictures of him₂] would upset John₂.

Of grave importance to the GB binding theory is the status of sentence 39a: given the way such notions as governing category and accessible

SUBJECT are defined, the entire clause of 39a must be chosen as the governing category for the pronominal/anaphor within the *picture*-NP. Recall 32a' and the discussion thereof. Therefore, the GB binding theory should predict that the pronominal within the *picture*-NP in 39a must be free in its governing category, which means that it must be disjoint in reference with anything that occurs in the entire sentence—this prediction is clearly false, as is indicated by the grammaticality of 39a.

To recapitulate, the binding relations observed in 32a and 32b exhibit these three properties: (i) non-uniqueness of binding relations; (ii) binding by split antecedents; (iii) free variation with pronominal indexing.²⁸ We have seen that the fact that the binding relation in 32a has these properties, which we argue are the diagnostics for nonlocal binding, is a serious problem for the binding theory of GB, since it predicts that this type of binding must be a case of local binding.

Under the present analysis, this situation comes as no surprise, since it is easy to show that the binding relations in 32a and 32b have the same status with respect to θ -superiority—in neither of these sentences is the anaphor bound by an antecedent θ -superior to it.

To see that the binding relation in 32a is a case of nonlocal binding, let us consider the structure of this sentence a little more carefully.

- (32) a". John₂ thinks [_{S'} that [_{S₀} [_{NP*} pictures of himself₂] would win the prize]]

The subject of the matrix clause is θ -superior to the complement S' (and S°). But it is not θ -superior to the subject of S°, viz. NP*—this is because the θ -domain S° is θ -closed since it contains the external argument NP*, which presumably is assigned the θ -role of Agent. Thus the provision for θ -superiority 28 is not applicable here, and therefore the subject of the matrix clause in 32a" is shown not to be θ -superior to NP*. Since the subject of the matrix clause is not θ -superior to NP*, it cannot be θ -superior to the anaphor within NP* either. It is also easy to see that

²⁸ As a fourth criterion, one might point out the (non)obligatoriness of binding relations: in sentences involving nonlocal binding, the binding is not obligatory even in the presence of a possible binder within the sentence.

(i) John₂ thinks [that [pictures of oneself₀] are always disappointing]
In i, which is structurally analogous with 32a, it is possible for the anaphor not to be bound by *John*, though this binding is certainly permissible, as is shown by the grammaticality of 32a, and the anaphor here has a generic interpretation. This is impossible, once there is a possible binder within a local domain:

(ii) *a picture of oneself₀ by Rockwell₂

neither NP* nor the anaphor within it is θ -superior to the subject of the matrix clause. Therefore the binding relation in 32a falls under the case 31B—a default case of anaphoric binding.

Similarly for 32b, whose structure is this:

(32) b". [_{NP*} Those pictures of himself₂] would upset John₂
NP*, being the most external argument, is θ -superior to the object of *upset*. But, although NP* is θ -open, it does not allow us to infer that the anaphor within NP* is also θ -superior to *John*: the provision for θ -superiority 28 simply states that something can be θ -superior to an anaphor within a θ -domain if that something is θ -superior to the θ -domain containing the anaphor and that θ -domain is open, but it does not allow the converse to be true—an anaphor within a θ -domain cannot be θ -superior to something even if the θ -domain containing the anaphor is θ -superior to that something. Therefore, the anaphor in 32b" is not θ -superior to *John*. Nor is *John* θ -superior to the anaphor, since *John* is not θ -superior to NP*; so, again, the provision 28 is off the wall here. Since neither the anaphor nor its antecedent is θ -superior to the other, the binding relation in 32b falls under the case 31B, as does that in 32a.

The fact that pronominals can be used in place of anaphors in these constructions is naturally expected in the present analysis: as was mentioned above, I assume that the condition on pronominal indexing in English includes a restriction based on θ -structure: neither a pronominal nor its antecedent may be θ -superior to the other; in other words, a pronoun and its antecedent may not appear in the same θ -domain. This requirement is clearly satisfied in either of 39a and 39b. Since the effect of the Tensed S Condition does not apply in these sentences, we expect that anaphors and pronominals should be freely interchangeable here. Notice that such a situation is logically impossible, given the Binding Principles A and B of the GB binding theory.

4. CONCLUDING REMARKS. We have argued in the foregoing sections that the theory of anaphoric binding must be primarily characterized in terms of thematic structure rather than configurational properties such as *c*-command and accessibility. We have seen that notions that derive from thematic structure define not only the structural relation between an anaphor and its antecedent but also the theory of locality that delimits the domain in which the relation of anaphoric binding may take place. Where the configurational theory of anaphoric binding defines the structural relation of binding in terms of the notion *c*-command, which

essentially is a way of measuring the relative prominence of a node in a tree in configurational terms, the present theory defines the structural relation of anaphoric binding using the notion θ -superiority, which captures the relative prominence of a node in thematic terms—a node (argument) is θ -superior to another if that node is assigned a θ -role that is more external given the hierarchy of θ -roles (8): Theme is most internal, Agent is most external, and oblique arguments are in between. Where the configurational theory (such as GB) defines the local domain for binding on the basis of such configurational notions as accessibility, which in turn derives from c -command, the present theory defines the local domain for binding based on such thematic notions as θ -domains, which simply consist of a θ -assigner and its arguments, and ‘ θ -closedness’, which is sensitive to the presence of an external argument (Agent), rather than an accessible SUBJECT.

The picture that emerges from the present discussion points to the same direction as the theory of control developed in Nishigauchi 1984: there, it is shown that cases of so-called ‘nonobligatory control (NOC)’ (in the sense of Williams 1980) must be divided into two classes, each of which can be illustrated by the following:

- (40) a. John told Mary₂ [what e_2 to do]
 b. John told Mary [that it was unclear [what e to do]]

(where e stands for an empty category, which, in these cases, is characterized as ‘PRO’.) The control relation in 40a can be determined in terms of θ -structure, in such a way that the argument in the immediately higher clause which has the θ -role of Goal with respect to the transition of information by *tell*, viz. *Mary* is chosen as controller, while in 40b this type of thematic characterization is unavailable. Further, the above-mentioned paper shows that the control relation exemplified in 40a has the properties which are analogous with those associated with the cases of local binding which we discussed in section 3 of the present paper: (i) the control relation is uniquely determined; (ii) control by split antecedents is disallowed; (iii) control is (highly) obligatory if a controller is available. (As for the third of these, cf. fn. 28.) Furthermore, the structural principle which distinguishes the two types of control in 40 is claimed to be the θ -domain—control is thematically determined if there is a possible controller within the θ -domain which immediately contains a minimal category that contains PRO; otherwise, control is free (pragmatically determined).

This striking resemblance between the theory of anaphoric binding

and the theory of control should not be accidental—in either case, the restriction of locality is a natural consequence of the local nature of θ -role assignment. Thematic structure with respect to a given θ -assigner can be determined only within a locally restricted domain—this is the basis for the idea of θ -domains. Give this, it will be easy for the child learning English to recognize the locality requirement for grammatical processes to which the system of θ -structure is relevant. Thus, the present theory offers an alternative to the view explored by Matthei 1981 and Otsu 1981, who assume a direct conceptual link between the notion of reciprocity (associated with *each other*, a case of anaphoric binding) and the notion of clause-boundedness, where the extra-linguistic notion of reciprocity serves essentially as a trigger for the acquisition of locality principles.²⁹ The present theory, on the other hand, suggests that the two notions must be mediated by the notions related to, or derived from, θ -structure. Thus, once the child recognizes that the structural relations involved in control and anaphoric binding are dictated by θ -structure, s/he will immediately come to know that the processes are subject to the locality requirement, which restricts θ -structure as well.

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²⁹ Edwin Williams (p.c.) has suggested to me that this conceptual link between reciprocity and locality might be refuted by the behavior of sentences involving *each...the other*, as in:

(i) *Each* of the men thinks that [*the other* will win]

Although this type of construction is related to the notion of reciprocity, the anaphoric relation as in (i) is not in general subject to the kind of locality restrictions governing *each other*. Cf. Chomsky 1973.

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