For Ed,
With Thanks.
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Categories, Structures, and Principles of Anaphoric Dependencies

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by

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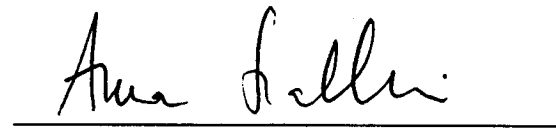The dissertation of Hyunoo Lee is approved.

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To My Mother and Father, Heonsun & Jong-Chul Lee, and

to my family, Jiyong & Namsuk Lee

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LIST OF ABBREVIATIONS

ABS	absolutive
ACC	accusative
ART	article
ASP	aspect
DE	declarative ending
DIR	directional
ERG	ergative
GEN	genitive
NOM	nominative
pref-	prefix
PRES	present
PROG	progressive
PST	past
3s	third person+singular
TOP	topic

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ABSTRACT OF THE DISSERTATION

Categories, Structures, and Principles of Anaphoric Dependencies

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In this dissertation we study the form and interpretation of the anaphor-antecedent (AA) relation in natural languages. We explore a new approach to the question why anaphors and their antecedents are asymmetrically distributed in natural languages.

In distinction to the current approaches that attribute the asymmetry of the AA relation to a condition which is, itself, asymmetric or whose asymmetry follows from that condition plus other (related) properties of the grammar, our approach does not impose constraints directly on the AA relation. Rather we formulate a single axiom which constrains the presence of possible antecedents of anaphors (referentially autonomous NPs). This axiom, called the Principle of Referential Autonomy (PRA), says that natural languages provide a uniform way of structurally identifying at least one NP in basic sentences as referentially autonomous.

Together with certain language-specific facts, the PRA derives the effects of the Anaphora Asymmetry Universal (AAU) that if an NP A antecedes an anaphor B in a

sentence S, then there is no S' syntactically isomorphic to S which replaces A with an anaphor A' and B with an RA NP B' understood to antecede A'. In doing this, we provide one mechanism whereby judgments of ungrammaticality can be derived entirely from positive data.

Cross-theoretical and cross-linguistic evidence shows that our approach is more conceptually constrained and empirically motivated than any existing theories of anaphora. Our analysis easily accounts for the AA relation established asymmetrically for a sentence structure type of a language rather than for language itself and gives a natural explanation of the asymmetry of anaphoric dependencies in languages like Toba Batak and Samoan in which there seems to be no uniform way of applying any pretheoretical notion of "subject" or "nominative". Characterizing crossover as another manifestation of the AAU, we also provide a unified account of strong and weak crossover in terms of the PRA plus the notion of (syntactically complex) referentially autonomous NPs.

Finally, we extend the PRA to fully deduce the AAU in more complex contexts like two-complement verb sentences and coordinate structures. Generalizing the notion "referentially autonomous" to other phrasal categories, we reformulate the PRA as a principle that constrains the way we construct an arbitrary type of referentially autonomous expressions from semantically defined referentially autonomous NPs.

Chapter 1

Introduction

1.1.   Focus of the Inquiry

For the past several decades, *anaphora* has been a central issue in linguistic theory. One anaphora puzzle that has emerged from this work is that anaphors and their antecedents are *asymmetrically* distributed in natural languages, as illustrated in (1).

(1)   a.   Someone$_i$ criticized himself$_i$.
       b.   *Himself$_i$ criticized someone$_i$.

In (1a), the reflexive pronoun *himself* in the object position is understood to be anteceded by the subject NP *someone*. Logically, it is equally possible to interpret the reflexive pronoun *himself* in the subject position of (1b) to be anteceded by the object NP *someone*. However, English does not allow this logical possibility. In fact, none of the natural languages studied so far admit pairs of sentences like (1), though saying exactly what it means for sentences in an arbitrary language to be just like (1) is a non-trivial problem. The present study explores a new approach to this problem.

From the earliest period of generative linguistics, researchers from different theoretical frameworks have, in effect, suggested different ways of predicting the fact that the anaphor-antecedent (AA) relation is asymmetric across languages. Virtually every theory either assumes or explicitly stipulates that the AA relation in the language

under study satisfies a condition which is, itself, asymmetric or whose asymmetry follows from that condition plus other (related) properties of the grammar. Thus on some approaches taken by Jackendoff (1972) and Wilkins (1988), antecedents of anaphors must outrank them on a thematic role hierarchy, and *outrank* is an asymmetric relation (if x outranks y then y cannot also outrank x). Similarly on familiar Binding-Theoretic accounts initiated by Chomsky (1981, 1986b), anaphors must be c-commanded by their antecedents (Principle A) and cannot c-command them (Principle C). Working together, these two principles guarantee that anaphors are asymmetrically c-commanded by their antecedents. Other approaches like Pollard and Sag 1992 invoke a hierarchy of grammatical functions such as "subject", "object", etc., wherein again the antecedent must outrank the anaphor on that hierarchy.

Following Keenan (1991, 1993), we argue that approaches that overtly constrain the AA relation to satisfy a condition which is asymmetric cannot fully derive the language universal that anaphors and their antecedents are asymmetrically distributed in natural languages. By contrast, in this dissertation, we do not impose constraints directly on the AA relation. Rather we posit a single axiom which constrains the distribution of *referentially autonomous* (RA) NPs. Then, in principle *referentially dependent* (RD) NPs may occur anywhere consistent with the distribution of the RA ones (though, in practice, there will be some additional constraints). See Keenan 1988b, 1989 for the algebraic characterization of RA NPs and RD ones for the contexts of interest to us.

Informally, RA NPs are ones whose interpretation does not depend on other NPs in the sentence. For example, the bracketed NPs in (2) below are RA.

(2) a. [Every student] criticized [Mary].

  b. [Most of John's students] criticized [no one but Mary].

On the other hand, the bracketed NPs in (3) are referentially dependent on others in the sentence.

(3) a. Every student criticized [himself].

  b. Most of John's students criticized [no one but himself].

The basic claim which we elaborate and defend in this thesis is given by the Principle of Referential Autonomy (PRA). An informal statement, which is designed to give the basic idea but which contains many terms to be explicitly defined later, is provided in (4).

(4) Principle of Referential Autonomy (Informal)

  Natural languages provide a uniform way of structurally identifying at least one NP in basic sentences as referentially autonomous.

For example, in the English (5) and Korean (6) sentences below, the NPs that are structurally identified as RA by the grammars of those languages are the ones bracketed.

(5) a. [Every student] criticized himself.

  b. [Every student] criticized every student.

  c. [More than half of the students] read more than half of the books.

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(6) a. [Motun haksayng-i] caki-lul pinanhay-ss-ta.
every student-NOM self-ACC criticize-PST-DE
'Every student criticized himself.'

b. [Motun haksayng-i] motun haksayng-ul pinanhay-ss-ta.
every student-NOM every student-ACC criticize-PST-DE
'Every student criticized every student.'

c. [Pan isang-uy haksayng-i] pan isang-uy chayk-ul ilh-ess-ta.
half above-GEN student-NOM half above-GEN book-ACC read-PST-DE
'More than half of the students read more than half of the books.'

Note that other NPs in these sentences may in fact be RA, but the PRA for these grammars do not force that. For example, all occurrences of *every student* in (5b) are RA, but only the "subject" occurrence must be, as (5a) shows.

A crucial ingredient of the PRA consists in stating rigorously just what it means to be "structurally identifiable". Here we build on work by Keenan and Stabler (1992). What is crucial to note is that the notion "structurally identifiable" is relative to a given grammar. Thus the grammar of Korean and English differ in certain respects, and the means used, we claim, to identify the structurally RA NPs are somewhat different.

Given our means, spelled out in Ch. 2, of structurally identifying the RA NP in English, we will predict the judgments in (7).

(7) a. *Himself laughed.
b. *This picture of themselves sells well.
c. *Himself$_i$ laughed and criticized Bill$_i$.
d. *Himself$_i$ criticized himself$_i$.
e. *Himself$_i$ criticized everyone$_i$.
f. *No one but himself$_i$ criticized some student$_i$.

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The reason is that the NPs structurally identified as RA here in fact fail to be RA, rather they are referentially dependent.

On the one hand, this allows directly that different languages, in effect, constrain the distribution of anaphors and antecedents by different means. E.g., case marking is basic in Korean in a way in which it is not in English. Thus our approach in principle allows for somewhat different distributions of anaphors in different languages. It also does not require inaudible levels of structure (though this may be enlightening for other purposes).

On the other hand, to avoid logical circularity or other forms of empirical vacuity, our approach forces a language independent definition of *structurally identifiable*. If we can simply make up the definition to suit the anaphora facts in whatever language we study then the PRA has no predictive value at all. Thus in Ch. 2, we give a language independent definition of *structurally identifiable*.

Another crucial ingredient of the PRA consists in a proper definition of *referentially autonomous* and, implicitly, *referentially dependent*. What is important here, and distinctive of the approach we take, is that these notions have a proper semantic definition. That is, whether an NP is referentially autonomous or dependent depends on what it denotes. Formally we draw on work in generalized quantifier theory to make these notion precise. But, the underlying idea can be exemplified as follows. Consider a VP built from a transitive verb like *criticized* and an NP like *most of John's students*. Whether such a VP is true of an individual, say Bill, depends entirely on the set of objects that Bill bears the CRITICIZE relation to. Thus if the individuals Bill bears the CRITICIZE relation to are the same as those that Sam bears the PRAISE relation to, then (8a) and (8b) must have the same truth value.

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(8)   a.   Bill criticized most of John's students.

        b.   Sam praised most of John's students.

By contrast, if we replace most of John's students with *himself* (or *both John and himself*, or *everyone but himself*), the resulting sentences (9a) and (9b) may have different truth values.

(9)   a.   Bill criticized himself.

        b.   Sam praised himself.

Suppose, for example, that the individuals Sam praised are exactly Frank, Bill, and Martha, and that those are exactly the individuals that Bill criticized. Then, as noted, (8a) and (8b) have the same truth value, but (9b) is false while (9a) is true. Thus whether the denotation of the VP *criticized himself* is true of an individual, say Bill, depends not just on the set of objects Bill stands in the CRITICIZE relation to, it also depends on which individual Bill is. John and Bill may stand in the CRITICIZE relation to the same individuals, but the truth of *John criticized himself* and *Bill criticized himself* may differ. In this way then, formalized in Ch. 2, we distinguish between RA and RD NPs.

1.2.   Overview of the Thesis

In more detail, this dissertation is organized as follows. In Ch. 2 below we first explicitly state what is meant by the asymmetric distribution of anaphors with respect to their antecedent in basic clause types of a language. As the strongest constraint on the

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AA relation, we propose the Anaphora Asymmetry Universal (AAU). This universal says that if an NP A antecedes an anaphor B in a sentence S, then there is no S' syntactically isomorphic to S which replaces A with an anaphor A' and B with an RA NP B' understood to antecede A'. Building on the relational conception of language structure and language invariants advanced in Keenan and Stabler 1992, we then formulate a principle of semantic interpretation called the Principle of Referential Autonomy (PRA). Together with certain English and Korean-specific constraints, the PRA derives the effects of the AAU in those languages. In doing this, we provide one mechanism whereby judgments of ungrammaticality can be derived entirely from positive data. In distinction to more standard Binding-Theoretic accounts, the PRA directly constrains the presence of possible antecedents of anaphors (= RA NPs) rather than the distribution of anaphors themselves.

In Ch. 3 we discuss further linguistic motivations for the PRA. From the cross-theoretical and cross-linguistic points of view, we argue that the way we explain the AAU in terms of the PRA plus certain language-specific facts is more conceptually constrained and empirically motivated than any existing theories of anaphora. Our analysis will be shown to easily account for the AA relation which is established asymmetrically for a sentence structure type of a language rather than for language itself. In particular, it gives a natural explanation of the asymmetry of anaphoric dependencies in languages like Toba Batak and Samoan in which there seems to be no uniform way of applying any pretheoretical notion of "subject" or "nominative". Extending our approach further, we provide a unified account of strong and weak crossover. As a first step towards a uniform treatment of crossover, we characterize crossover as another manifestation of the AAU. Together with the notion of (syntactically complex) RA NPs, the PRA accounts uniformly for all the problematic

cases for theories of bound anaphora that seek to explain crossover in terms of a necessary condition on bound anaphora. We show that the proposed account is simpler and more descriptively adequate than alternative theories of (weak) crossover.

In Ch. 4 we point out that the PRA, as formulated in Ch. 2, is not general enough to fully deduce the AAU in more complex contexts such as two-complement verb sentences, coordinate structures, etc. In order to cope with the problem, we first generalize the notion of "referentially autonomous" to other categories. This generalization enables us to treat nuclear sentences as a specific type of RA expression. We then reformulate the PRA as a principle that constrains the way we construct an arbitrary type of RA expressions from semantically defined RA NP occurrences.

Chapter 2

Towards an Axiomatic Theory of Referential Dependencies

2.1. Introduction

In section 2 below, we summarize and add to the support for the claim that anaphors and their antecedents are *asymmetrically* distributed in basic clause types of a language. We characterize the asymmetry of the anaphor-antecedent (AA) relation in terms of language-independent notions and take our characterization, the Anaphora Asymmetry Universal, to be the strongest *descriptive* constraint on the form of anaphoric dependencies. In section 3 we first formulate and defend a certain principle of semantic interpretation called the Principle of Referential Autonomy. Together with certain English and Korean-specific constraints, it enables us to derive the claim that anaphors and their antecedents are asymmetrically distributed in these languages. Secondly, we provide one mechanism whereby judgments of ungrammaticality can be derived entirely from positive data. Our approach differs from more standard Binding-Theoretic accounts in that it directly constrains the presence of possible antecedents of anaphors (= referentially autonomous NPs) rather than the distribution of anaphors themselves.

2.2. The Anaphora Asymmetry Universal

At the level of observable structures, different languages present different ways of coding anaphoric dependencies. Let us limit ourselves to *binary nuclear* sentences,[1] ones which are formed by a *2*-place predicate and two *independent* occurrences of NPs, but nothing else, and whose truth conditions are computed independently of the utterance context they occur in. (An NP occurrence is called independent iff it is not a proper subconstituent of another NP occurrence.) Then we find that such diverse linguistic devices as linear precedence, constituency, case marking, and verbal affixation are being employed to represent anaphoric dependencies even in those simple sentences.

Investigating the NP reflexive anaphors with local antecedents in a sample of verb-initial languages, Keenan (1991) supports that there is no common structural relation relating anaphors to their antecedents. Among the language-specific anaphora constraints Keenan proposes is the following:

(1)   Batak Anaphora Constraint (BAC)

In binary nuclear sentences *A* may antecede *B* iff *B* forms a constituent with a *mang*-prefixed verb or *A* forms a constituent with a *di*-verb.

The following Toba Batak examples motivate the BAC in (1):

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[1]For the general definition of an *n-ary nuclear* sentence, see (16) below.

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(2)   a.   Mang-ida dirina   si   Torus.
              sees   self-his ART
              'Torus sees himself.'

    b.   Di-ida si Torus dirina.
              saw   ART   self-his
              'Torus saw himself.'

    a'.   *Mang-ida si Torus dirina.
              sees   ART   self-his
              'He-self$_i$ sees Torus.'

    b'.   *Di-ida dirina   si   Torus.
              saw   self-his ART
              'He-self$_i$ saw Torus.'

Based on Schachter's (1984) observations, Keenan (1988b, 1989) convincingly argues that irrespective of the types of verbal prefixes, the Batak transitive sentences have the form:

(3)   [[pref-V NP$_1$] NP$_2$] where pref is *Mang-* or *Di-*

In (2a) the reflexive *dirina* forms a constituent with the *mang*-prefixed verb. In (2a'), however, the antecedent *si Torus* forms a constituent with *mang-ida* to the exclusion of the reflexive, violating the BAC. The contrast between (2b) and (2b') shows that when *dirina* is a complement NP of the *di*-prefixed verb, it is its antecedent that forms a constituent with the verb.

Ad hoc account as it might appear, the BAC is worthy of note. As Keenan (1991) argues, this anaphora constraint is taken to be evidence against the simplistic C-Command Condition in (4).

(4)   C-Command Condition

       Anaphors must be c-commanded by their antecedents in surface constituent structure.

Given the structural assumption in (3), (4) makes correct predictions in the case of the *mang*-prefixed verb, but incorrect ones in the case of the *di*-prefixed verb. Therefore, the alleged universal condition fails to characterize the AA relation language-independently. A careful examination of the sentences in (2), however, reveals one universal property of the AA relation. Keenan (1991) makes an empirical observation that in all verb-initial languages he studied, the AA relation is asymmetric. That is, if an NP A antecedes an anaphor B in a sentence S, then there is no S' syntactically isomorphic to S which replaces A with an anaphor A' and B with a referentially autonomous (RA) NP B' understood to antecede A'.[2] Cf. (2a)-(2a'); (2b)-(2b').

       The asymmetry of anaphoric dependencies is not limited to verb-initial languages, but obtained in other types of languages, too. Let us consider the following English examples:

(5)   a.   [John [$_{VP}$ criticized Bill]].
       b.   [John [criticized himself]].
       c.   *[Himself [criticized John]].

Empirical work suggests that *Bill* forms a constituent with the verb *criticized* to the

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[2]By referentially autonomous NPs, we mean the NPs interpreted as generalized quantifiers (GQs) or case extensions of GQs. NPs like *himself* are not referentially autonomous, but referentially dependent. For the contexts of interest to us, Keenan (1988b, 1989) and Ben-Shalom (in progress) mathematically characterize the difference between referentially autonomous NPs and referentially dependent ones. For more details, see the discussion below.

exclusion of *John* in (5a). In (5b) the subject NP *John* antecedes the reflexive *himself*. Given the Compositionality Principle in (6) and the interpretation of the reflexive in (7a), (5b) is assigned the reading in (7b).

(6)   The meaning of an expression is a function of the meanings of its parts and of the way they are syntactically combined.

(7)   a.   SELF(R) = {b: bRb}, for any binary relation R
        b.   JOHN(SELF(CRITICIZE)) = JOHN(λx[x CRITICIZE x]).

This meaning assignment entails that *himself* forms a constituent with the verb *criticized* to the exclusion of *John* in (5b). In (5c) the object NP *John* antecedes *himself*, resulting in the ungrammaticality of the sentence. The contrast between (5b) and (5c) suggests that the asymmetry of the AA relation also holds of English. Crucial to this argument is that (5b) and (5c) have the same structure; they just differ by lexical substitution. It is well-known that simple interchange of words may not guarantee "same structure", as (8) shows.

(8)   a.   Hans hat das Buch gelesen.
                    has the   book read
              'John has read the book.'

        b.   Das Buch hat   Hans gelesen.
              the   book has   read
              'The book, John has read.'

All theories would assign the two sentences somewhat different structures. If a language *L* were like English but with a strong V2 constraint, and so allowed the sentences in (9) below,

(9) a. Hans has himself criticized.
     b. Himself has Hans criticized.

both sentences might be acceptable insofar as they have different structures. So merely interchanging the anaphor and antecedent does not decide the issue. The interchanging must preserve structure to be relevant to the question.

We have shown that the AA relation is asymmetric in English and argued that the Asymmetry issue is dependent on whether interchanging the anaphor and antecedent preserves structure. Recapitulating the last point, we will show that the asymmetry of the AA relation also holds of an SOV language like Korean. Consider the following Korean examples:

(10) a. John-i   caki-lul   pinanhay-ss-ta.
          -NOM   self-ACC   criticize-PST-DE
          'John criticized himself.'

      b. Caki-lul   John-i   pinanhay-ss-ta.
          self-ACC   -NOM   criticize-PST-DE
          'Himself, John criticized.'

      c. John-i   caki-ka   miw-ess-ta.
          -NOM   self-NOM   hate-PST-DE
          'John hated himself.'

      a'. *Caki-ka   John-ul   pinanhay-ss-ta.
           self-NOM   -ACC   criticize-PST-DE
           'He-self$_i$ criticized John$_i$.'

      b'. *John-ul   caki-ka   pinanhay-ss-ta.
           -ACC   self-NOM   criticize-PST-DE
           'John$_i$, he-self$_i$ criticized.'

c'. *Caki-ka   John-i   miw-ess-ta.
     self-NOM   -NOM   hate-PST-DE
     'He-self$_i$ hated John$_i$.'

In Korean a subject NP is case marked by -*ka* if it ends with a vowel, and by -*i*, otherwise. An object NP is case marked by -*ul* if it ends with a vowel, and by -*lul*, otherwise. (10a) with SOV order and its OSV alternate (10b) suggest that regardless of linear precedence, the nominative marked NP may antecede the accusative marked anaphor. The ungrammaticality of (10a') and (10b') shows that the accusative marked NP may not antecede the nominative marked anaphor. As in (10c), Korean also presents a class of verbs that select two nominative marked NPs. In the sentences headed by such verbs, the first nominative marked NP is interpreted as Experiencer, and the second, as Theme. The contrast between (10c) and (10c') indicates that anaphors must be preceded by their antecedents in those sentences. This leads us to propose the following anaphora constraint:

(11)   Korean Anaphora Constraint (KAC)

In binary nuclear sentences an NP *A* may be interpreted as the antecedent of an anaphor *B* iff *A* is suffixed with -*ka*/-*i* and *B* with -*ul*/-*lul*, or *A* and *B* are both suffixed with -*ka*/-*i* and *A* precedes *B*.

Now compare the grammatical sentences in (10) with their corresponding ungrammatical ones. The latter sentences may be regarded as sentences derived by keeping the same case paradigm of the former but replacing the reflexive *caki* and RA NPs with each other. Given natural structural assumptions, this fact suffices to show that the AA relation is asymmetric in Korean and supports the position that the

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asymmetry of the AA relation is an empirically observable language universal. Notice that to interchange the anaphor and antecedent (carrying along the case markers) does not give rise to the Asymmetry effect, as shown in (10a) and (10b). An appropriate analysis would assign the two sentences different structures. By contrast, (10c) and (10c') would be treated the same even though each reverses the order of the *case marked* anaphor and antecedent of the other. That (10c) and (10c') have the same structure is borne out by the following sentences:

(12)   a.   John-i   Mary-ka   miw-ess-ta.
                 -NOM   -NOM   hate-PST-DE
                 'John hated Mary.'

        b.   Mary-ka   John-i   miw-ess-ta.
                 -NOM   -NOM   hate-PST-DE
                 'Mary hated John.'

As the translations show, (12a) expresses only the proposition 'John hated Mary', and (12b) expresses only the proposition 'Mary hated John'; neither of the sentences can express the proposition that the other does. In this respect, they are contrasted with (8) and (9), which we assume would express the same proposition and thus be assigned different structures.[3]

Our discussion of the Korean examples above clearly shows how the asymmetry of the AA relation obtains. Without further argument, we take this asymmetry to be one of the language universals concerning anaphoric dependencies and state it a little formally, as follows:

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[3]As will be clear in section 2.3.2.2, the argument given above crucially assumes that Korean sentences do not have *flat* but *hierarchical* structures although case marking plays a key role in determining the structure of a sentence in Korean.

(13)　Anaphora Asymmetry Universal (AAU)

Let an NP *X* antecede an anaphor *Y* in a sentence *S*. If the result of replacing *Y* with an RA NP *Y'* and *X* with an anaphor *X'* preserves the structure of *S*, *Y'* cannot be understood as an antecedent of *X'*.

One remark is in order here. The statement given in (13) naturally allows us to capture the difference in grammaticality judgment of the sentences that are supposed to violate the AAU. Compare the following examples:

(14)　a.　*Himself criticized John.

　　　b.　Caki-ka　John-ul　pinanhay-ss-ta.
　　　　　self-NOM　-ACC　criticize-PST-DE
　　　　　'He-self criticized John.'

Whereas (14a) is utterly ungrammatical in English, (14b) may be grammatical in Korean. Note, however, that (14b) is grammatical only when the *ka*-marked *caki* is discourse-bound, i.e., only when the reflexive merely refers to someone previously mentioned in linguistic discourse. Like (14a), (14b) lacks the reading on which the reflexive NP is anaphorically dependent on *John*.[4] Since Standard American English does not allow reflexives to be used deictically in such binary nuclear sentences, (14a) is never grammatical in that language.

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[4]Sentences like (14b) may be used in the following discourse context:

(i)　A:　Mary-ka motun salam-i John-ul pinanhay-ss-ta-ko　hwanay-ss-ta.
　　　　　-NOM every man-NOM -ACC criticize-PST-DE-that get angry-PST-DE
　　　　　'Mary got angry that everyone criticized John.'
　　　B:　Caki-ka　mence John-ul　pinanhay-ss-ta.
　　　　　self-NOM first　　-ACC　criticize-PST-DE
　　　　　'Self[Mary] criticized John first.'

While we might consider taking the AAU as a basic constraint on the form of natural language, we would prefer to derive it from independently motivated principles of grammar. Below we pursue the latter objective in terms of the approach to language structure and language invariants in Keenan and Stabler 1992.

2.3. The Principle of Referential Autonomy (PRA)

2.3.1. Formalizing the PRA

Our explanation of the AAU is based on a certain principle of semantic interpretation called the Principle of Referential Autonomy (PRA) and some language-particular facts that help language learners identify where a referentially autonomous NP must occur. Thus, we are concerned with where referentially autonomous NPs occur rather than where anaphors occur. We will show that if the AAU fails in a given language, then the principle we will formulate also fails in that language.

We begin with an informal version of the PRA:

(15)   Principle of Referential Autonomy (Informal)

For each language L,

i.   in each nuclear sentence S of L, at least one independent NP occurrence is referentially autonomous (RA), and

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ii. *L* provides a structurally uniform way of identifying the required RA NP in each *S*. That is, whenever sentences *S* and *T* are isomorphic (= have the same structure), then the NP *L* identifies in *T* is the isomorphic image of the one it identifies in *S*. I.e., it makes the "same" choice for *T* as it does for *S*.

Leading to a somewhat more rigorous statement of the PRA,[5] we elaborate on some of the basic notions used above:

(16) <u>Def</u>. 1: Let XP be an arbitrary phrase. An XP occurrence is *independent* iff it is not a proper subconstituent of another XP occurrence.

      <u>Def</u>. 2: A sentence S is called an *n-ary nuclear* sentence iff (i) S consists of *n* independent NP occurrences whose interpretation is constant across utterance contexts, an *n*-ary predicate, and nothing else, and (ii) S is independent.

We illustrate the above definitions with the following sentences:

(17) a. [NP John and Mary] criticized [NP no one but Bill].
      b. [S Everyone said that John criticized Bill's mother].

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[5]Before we proceed, we note that the PRA (15) has an informal precursor in Keenan 1976:

(i) Principle of Autonomous Reference

In the basic sentence types of a language L, a combination of case marking, position, and verb agreements function to identify exactly one NP as being in principle autonomous in reference.

(18)   a.   John laughed.   (a unary nuclear sentence)

          b.   John's mother criticized Bill's friends.   (a binary nuclear sentence)

          c.   He laughed loudly.   (a nonnuclear sentence)

          d.   John laughed and Bill snored.   (a nonnuclear sentence)

Definition 1 says that in (17a) only *John and Mary* and *no one but Bill* are independent NP occurrences; no other NP occurrences are independent since they are properly contained by another NP occurrence. Note that the embedded S of (17b) is not an independent occurrence of S. Only the bracketed matrix S is independent. According to Definition 2, however, this S is not a nuclear sentence since it contains a complement clause. In (18) only (18a) and (18b) count as nuclear sentences. (18c) is not a nuclear sentence since its subject NP *he* is a deictic pronoun and since it contains the adjunct phrase *loudly*. Even though each conjunct sentence of (18d) is a nuclear sentence, (18d) is not itself.

Let us now consider (19) and (20).

(19)   a.   [Most of John's students] criticized [Bill].

          b.   [No student in New York] reads [every paper published in the U.S.]

(20)   a.   No student criticized [himself].

          b.   Each student criticized [both himself and the teacher].

          c.   John criticized [everyone but himself].

As we noted in Ch. 1, all the bracketed NPs in (19) are referentially autonomous, whereas all the bracketed NPs in (20) are referentially dependent. These two types of NPs differ in one essential way. The contribution that RA NPs make toward the interpretation of the sentences they occur in DOES NOT DEPEND on the contribution that other NPs or elements in the sentences do, but the contribution that RD NPs make

toward the interpretation of the sentences they occur in DEPENDS on the contribution that other NPs or elements in the sentences do.

Based on the intrinsic difference mentioned above, Keenan (1988b, 1989) has proposed the invariance conditions that characterize RA NPs and RD ones mathematically. Before we discuss these invariance conditions, however, we should first introduce a semantic theory called the Semantic Case Theory (SCT).

Given a universe E of objects, one-place predicates P_1s denote subsets of E, called *properties*. Two-place predicates P_2s denote subsets of E^2 (viz. E x E), called *binary relations*. Common nouns (CNs) like *student* and intransitive verbs like *snore* are assigned to P_1s, and transitive verbs like *love*, to P_2s. An NP is called a *basic* NP iff it is combined with an one-place predicate P_1 to form a sentence, and its denotation is constant across utterance contexts. Basic NPs then denote generalized quantifiers (GQs) which send properties to 0 (FALSE) or 1 (TRUE). We call denotations of basic NPs *basic functions*.

As we will see below, SCT is a theory of sentence interpretation that provides a rigorous way to interpret (syntactically) complex sentences on the basis of the way we interpret the following basic type of sentences:

(21)   a.   [John] smiled.
       b.   [Every student] snored.

Sentence (21b) contains the basic NP, *every student*, which denotes that basic function EVERY STUDENT from properties to {0, 1} which sends a property q to 1 iff the property STUDENT is a subset of q. Thus (21b) is true iff whoever was a student snored. On the other hand, sentence (21a) contains the basic NP, *John*, which denotes

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that basic function I_j which sends a property q to 1 iff q is a superset of the property of being *j*.

Let us now consider the following binary nuclear sentences:

(22)   a.   John loves Mary.
         b.   Every student admired some teacher.

It is a non-trivial task to give a rigorous way of interpreting binary nuclear sentences on the basis of the way we interpret unary nuclear sentences. In the generalized quantifier theory initiated by Barwise and Cooper (1981) and Keenan and Stavi (1986), unary nuclear sentences like (21) are straightforwardly interpreted, as we have shown above. Although the generalized quantifier theory has been widely accepted, not much has been said about how to interpret NPs occurring in *n*-ary nuclear sentences. In interpreting sentences like (22), we may compose the transitive verb with its object NP by extending the basic denotation of the latter so that it takes the binary relation denoted by the former to a property. Once we extend the denotation of the object NP, there is no semantic reason not to extend the denotation of the subject NP in the parallel fashion. This is the approach Keenan's (1988b, 1989) SCT takes:

(23)   Accusative Case Extension

For F a basic function, F_{acc} is that extension of F which sends each binary relation R to the set of objects b which are such that F itself holds of the set of things b bears the relation R to. That is, $F_{acc}(R) = \{b: F(bR) = True\}$, where $bR =_{df} \{x: bRx\}$.

(24)   Nominative Case Extension

> For F a basic function, F_{nom} is that extension of F which sends each binary relation R to the set of objects b which are such that F itself holds of the set of things which bear the relation R to b. That is, $F_{nom}(R) = \{b: F(Rb) = True\}$, where $Rb =_{df} \{x: xRb\}$.

Here a basic function F means the GQ interpretation of an NP. The "lifted" functions, F_{acc} and F_{nom}, are functions which take properties to truth values and binary relations to properties. Accordingly, ACC and NOM are functions mapping GQs into such lifted functions, called *semantic cases*.

Let us now consider the following language-independent conditions Keenan (1988b, 1989) proposes to characterize RA and RD NPs:[6, 7]

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[6]Corresponding to (25) and (26) are the following *nominative* conditions:

(i)   Nominative Extensions Condition (NEC)

> A function F from binary relations to properties is the nominative extension of a basic function iff for all binary relations R, S and all objects a, b, if Ra = Sb then $a \in F(R)$ iff $b \in F(S)$.

(ii)   Nominative Anaphor Condition (NAC)

> A function F from binary relations to properties is a nominative anaphor iff for all binary relations R, S and all objects b, if Rb = Sb, then $b \in F(R)$ iff $b \in F(S)$.

[7]The case extensions conditions, the AEC and the NEC, are in fact stated as theorems of SCT in Keenan 1988b, 1989. For example, in order to prove AEC (25), we should show that $\{F_{acc}\lceil R | F \in [\mathbf{P} \to 2]\} = \{g \in [\mathbf{R} \to \mathbf{P}] |$ for all a, b, R, and S, if aR = bS, then $g(R)(a) = g(S)(b)\}$.

left-to-right:

> Let $G = \{g \in [\mathbf{R} \to \mathbf{P}] |$ for all a, b, R, and S, if aR = bS, then $g(R)(a) = g(S)(b)\}$. Show $F_{acc} \in G$. Let a, b, R, and S be arbitrary. Assume aR = bS. Then, by the definition of ACC, $F_{acc}(R)(a) = F(aR)$. By the assumption, $F(aR) = F(bS)$. By the definition of ACC, $F(bS) = F_{acc}(S)(b)$. By transitivity of =, $F_{acc}(R)(a) = F_{acc}(S)(b)$. Therefore, $F_{acc} \in G$.

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(25)   Accusative Extensions Condition (AEC)

A function F from binary relations to properties is the accusative extension of a basic function iff for all binary relations R, S and all objects a, b, if aR = bS then a $\in$ F(R) iff b $\in$ F(S).

(26)   Accusative Anaphor Condition (AAC)

A function F from binary relations to properties is an accusative anaphor iff for all binary relations R, S and all objects b, if bR = bS, then b $\in$ F(R) iff b $\in$ F(S).

Note that the AEC (25) is the stronger of the two conditions: if the denotation of an NP meets (25), it automatically meets (26). Since RA NPs denote basic functions GQs in unary nuclear sentences, the accusative extensions of their basic functions must meet (25). Let X be an NP occurring in the object position of a binary nuclear sentence. To say that the denotation of X in (27a) meets the AEC is to say that the truth of (27a) does not depend on who John is; it just depends on what objects John criticized.

(27)   a.   John [criticized X]
             b.   Bill [criticized X]

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right-to-left:

Assume $g \in G$. Show that for some $F \in [P \rightarrow 2]$, $g = F_{acc} \lceil R$. Define F_g: $P \rightarrow 2$ by $F_g(p) = 1$ iff for all b, $g(E \times p)(b) = 1$. Show then that for all R, $F_{g_{acc}}(R) = g(R)$ and thus $F_{g_{acc}}(R) = g(R)$. Observe first that for all a, b, aR = b(E x aR), since by the definition, b(E x aR) $=_{df}$ {y| (b, y) $\in$ E x aR} = {y| y $\in$ aR} = aR. Then assume $F_{g_{acc}}(R)(a) = 1$. By the definition of ACC, $F_g(aR) = 1$. By the definition of F_g, for all b, g(E x aR)(b) = 1. Since aR = b(E x aR), g(R)(a) = 1. Now assume $F_{g_{acc}}(R)(a) = 0$. By the definition of ACC, $F_g(aR) = 0$. By the definition of F_g, for some b, g(E x aR)(b) = 0. Since aR = b(E x aR), g(R)(a) = 0. Thus, $F_{g_{acc}}(R)(a) = g(R)(a)$. Since a is arbitrary, $F_{g_{acc}}(R) = g(R)$. Since R is arbitrary, $F_{g_{acc}} = g$. ♥

This completes the proof of the AEC. We will leave the proof of NEC to the readers.

So if Bill criticized exactly the same objects that John did, then (27a) and (27b) must have the same truth value (both true or both false) if X's denotation meets the AEC. Consider (28).

(28) a. John criticized [most of Sam's students].
      b. Bill criticized [most of Sam's students].

Suppose, for example, that Bill criticized exactly the same individuals John did, say John, Bill, Karin, and, Mary. Suppose further that Sam's students are John, Bill, and Frank. Then both (28a) and (28b) are true. Suppose Sam's students are John, Frank, and Susie. Then both (28a) and (28b) are false. This shows that the denotation of *most of Sam's students* meets the AEC (25), and hence it is referentially autonomous.

By contrast, *himself* is not referentially autonomous. It may be that John and Bill criticized exactly the same objects but that (27a) is false but that (27b) is true. Consider (29).

(29) a. John criticized himself.
      b. Bill criticized himself.

Suppose that John criticized Bill, Karin, and Mary and that those are just the objects Bill criticized. Then, (29a) is false but (29b) is true. Thus *himself* in (29a) is referentially dependent on *John*, since we may change truth value if we replace *John* by another name, even though its denotation criticized the same objects John did. In other words, the denotation of *himself*, the SELF function in (7a), fails to meet the stronger condition (25). As evidenced by (30), however, it meets the AAC (26).

(30) a. John praised himself.

b. John admired himself.

Suppose John praised exactly the same individuals that he admired. This then guarantees that (30a) is true iff (30b) is.

Thus far we have discussed how RA NPs differ from RD ones. The RA NPs occurring in nuclear sentences meet appropriate CASE EXTENSIONS conditions, whereas the corresponding RD NPs meet only the weaker ANAPHOR conditions. Given the distinction between the two types of NPs, we are now able to substantiate the PRA given informally in (15) above. Let us first consider the paradigm shown in (31)-(33).

(31) *John* laughed.   **one** RA NP

(32) a. *John* criticized *Bill.*   two RA NPs

b. *John* criticized himself.   **one** RA NP

(33) a. *John* introduced *Mary* to *Bill.*   three RA NPs

b. *John* introduced *Mary* to himself.   two RA NPs

c. *John* introduced *Mary* to herself.   two RA NPs

d. *John* introduced himself to *Mary.*   two RA NPs

e. *John* introduced himself to himself.   **one** RA NP

In a unary nuclear sentence like (31), there is only one independent NP occurrence, which is referentially autonomous. A binary nuclear sentence may present two independent referentially autonomous NP occurrences, as in (32a), or just one, as in (32b). A ternary nuclear sentence may present three independent referentially autonomous NP occurrences, as in (33a), or just two, as in (33b)-(33d), or just one, as in (33e). These data are consistent with the PRA. But consider (34).

(34)   a.   *Himself cried.

        b.   *Himself criticized himself.

Given how *himself* is interpreted in Standard American English, these expressions lack

an RA NP and thus are ungrammatical as sentences since they violate the PRA.[8]

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[8]The PRA (15) encounters some empirical difficulties. Consider (i).

(i)   a.   John and Mary read different books.
          b.   The same professor failed John and Mary.
          c.   Different students read different books.

Such researchers as Stump (1982), Clark and Keenan (1986), and Carlson (1987) have shown that NPs with *different* and *same* exhibit a bound reading. On one reading of (ia), the object NP *different books* is referentially dependent on the subject NP *John and Mary*. In (ib) the subject NP *the same professor* may be referentially dependent on the object NP *John and Mary*. In (ic) both NPs may be referentially dependent on each other. Since there is no RA NP in (ic), the PRA would incorrectly predict that it is ungrammatical. It would also incorrectly predict that the first two sentences are ungrammatical since the RA NP *John and Mary* is not uniformly distributed in those sentences.

    Tyhurst (1990) treats reciprocal NPs and NPs with *same, different*, etc. as denoting functions from binary relations to higher order properties--ones true or false of *sets* of individuals. Keenan (1992) proves that the interpretation of sentences like (ic) cannot be expressed by the iterated application of *type <1>* functions that reduce the arity of n-ary relations by one, but by a unary application of *type <2>* functions which take binary relations to truth values:

(ii)   Let R_n be the set $POW(E^n)$ of n-ary relations. F is a *type <1>* function (over E) if and only if

      a.   the domain of $F = \cup_n \geq 0 \ R_n + 1$, the range of $F \subseteq \cup_n \geq 0 \ R_n$, and
      b.   for all $n \geq 0$, all $R \in R_n + 1$, $F(R) = \{<a_1,...,a_n>|F\{b|<a_1,...,a_n, b>$ $\in R\} = 1\}$.

(iii)   F is a *type <n>* function (over E) if and only if

      a.   the domain of $F = \cup_k \geq 0 \ R_{k+n}$, the range of $F \subseteq \cup_k \geq 0 \ R_k$, and
      b.   for all $n \geq 1$, all $k \geq 0$, all $R \in R_{k+n}$,

        $F(R) = \{<a_1,...,a_k>|F\{<b_1,...,b_n>|<a_1,...,a_k,b_1,...,b_n> \in R\} = 1\}$.

In this work, we will ignore the referential dependencies involving *type <2>* functions or *type <1>* functions from binary relations to high order unary ones.

Furthermore, the sentences in (31)-(33) bear out the second part of the PRA, which says that all languages provide a uniform way of structurally identifying an NP in nuclear sentences as referentially autonomous. See the italicized *John* in (31)-(33). It seems to be the case that in English nuclear sentences, there is always an NP (provably unique) which is higher in the syntactic analysis tree than the other NPs in the sentence. This NP, called the "subject", is always interpreted as RA in nuclear sentences. Note that the identifying mechanisms need not be given in terms of syntactic hierarchy. (E.g., morphological identity of case markers is relevant in Korean, verbal morphology in Batak, etc.) The idea underlying *uniform identifiability* is that the structure of sentence depends on the lexical items occurring in it and the way they are combined. But our approach allows that different languages combine lexical items in different ways.

To implement our claim, we first introduce the notion of isomorphism invariance drawn from Keenan and Stabler 1992. Following them, we think of a language L as a set of categorized expressions built from a lexicon *LEX* and a set F of generating functions. Specifically, L is the closure of *LEX* with respect to the functions f in F. Then two expressions, σ and τ, are (syntactically) isomorphic iff each can be mapped to the other by a structure preserving map (a "hom"). A map (function) h from the expressions of L to the expressions of L preserves structure iff h preserves the domains of the generating functions and h commutes with each of them. That is, whenever $h(\sigma) = \tau$ then $f(h(\sigma)) = h(\tau)$ [equivalently: $F(h(\sigma)) = h(F(\sigma))$]. Then, to say that a function f is isomorphism invariant is just to say that f treats isomorphic expressions in the same way. That is, (35):

(35) Whenever some σ is isomorphic to τ, then the value $f(\tau)$ of f at τ is the isomorphic image of $f(\sigma)$. Formally, f is isomorphism invariant iff whenever $<\sigma, \tau> \in f$ and $<\sigma, \tau>$ is isomorphic to $<\sigma', \tau'>$ then $<\sigma', \tau'> \in$ f.

And we say that an isomorphism invariant function (structurally) identifies its value, since what value f has at a given expression is determined by the structure of that expression--once the structure of S in Dom(f) is given then the value of f at S is determined.

Given the above notions, we are now able to state the PRA more formally as follows:

(36) Principle of Referential Autonomy (Formal)

For each natural language L, there is an isomorphism invariant function f_L such that

i. Dom(f_L) includes the nuclear sentences of L, and

ii. For each nuclear sentence S, $f_L(S)$ is an independent RA NP occurring in S.

The domain of the function whose existence is guaranteed by the PRA includes all n-ary nuclear sentences. The PRA says that at least one of the independent NPs is structurally identifiable and RA in every nuclear sentence. Where the language is English or Korean, we are tempted to call the function referred to in the PRA "$Subject_L$" or "Nom_L", but this notation is misleading. It is in fact implausible to think that any pretheoretical notion of "subject" or "nominative" applies uniformly to languages with different structures. E.g., in Batak the RA NP identified as a function of the structure of Batak sentences does not correspond to the NP we might

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pretheoretically call "subject" in English: it is sometimes the agent, and sometimes not. For more discussion, see Keenan 1988b, 1989 and section 3.2.1 of this thesis. For this reason, we will call the function referred to in (36) RAF_L (for the referential autonomy function in L).

2.3.2. Deriving the AAU

In this section we will show how the PRA plus some English (and Korean) language-specific facts allow us to to deduce the AAU for those languages.

2.3.2.1. English

Turning to English, we claim that empirical study of English supports that sentences (37a) and (37b) are isomorphic.

(37)   a.   John criticized Bill.
         b.   Sam criticized Frank.

In particular, there is a structure preserving map h which maps *John* to *Sam*, *criticized* to *criticized*, and *Bill* to *Frank*, and a structure preserving map k which maps *Sam* to *John*, *criticized* to *criticized*, and *Frank* to *Bill*. Moreover, h maps *criticized Bill* to *criticized Frank*, and k maps *criticized Frank* to *criticized Bill*. Whether the two sentences are isomorphic is determined by how they are built up--so we are making assumptions regarding the grammar of English here. These are empirical claims--not

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justified here but just taken for granted. They are unproblematic on all theories. Note also that a function h mapping (37a) to (37b) cannot preserve structure if h maps, say, *John* to *Frank*. A structure preserving map which sends *John* to *Frank*, *criticized* to *criticized*, and *Bill* to *Sam* will map (37a) to *Frank criticized Bill*, not to (37b).

Let us now consider the sentences in (29), repeated as (38).

(38) a. John criticized himself.
      b. Bill criticized himself.

Again, it is obvious that (38a) and (38b) are isomorphic. There are a structure preserving map h mapping *John* to *Bill*, *criticized* to *criticized*, *himself* to *himself*, and *criticized himself* to *criticized himself* and a structure preserving map k mapping *Bill* to *John*, *criticized* to *criticized*, *himself* to *himself*, and *criticized himself* to *criticized himself*. Furthermore, as we justified in (29), *himself* is referentially dependent. More specifically, *himself* is interpreted as the SELF function in (39a), and thus (38a) is assigned the reading in (39b).

(39) a. $SELF(R) = \{b: bRb\}$, for any binary relation R

      b. $\begin{aligned} I_j(SELF(CRITICIZE)) &= I_j(\lambda x[x \text{ CRITICIZE } x]) \\ &= \lambda x[x \text{ CRITICIZE } x](j) \\ &= j \text{ CRITICIZE } j \end{aligned}$

Note that interpreting *himself* as the SELF function is a language-particular fact regarding *himself*.[9]

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[9]It does not hold, for example, in Irish English, as Keenan 1988b, 1989 shows. Indeed, (34a) and (34b) must be accounted grammatical in that language.

We can now infer the ungrammaticality of (40) from (41).

(40)   *Himself$_i$ criticized John$_i$.

(41)   a.   empirically given positive data such as (38)
        b.   assumptions regarding the structure of (37) and (38)
        c.   empirically determined interpretation of *himself* in (39a)
        d.   PRA

<u>Argument</u>: Suppose, contrary to fact, that (40) is grammatical. Then the referential autonomy function for English, $RAF_{English}$, which must identify *John* in (38a) as RA, must identify *himself* in (40) as RA since $RAF_{English}$ is isomorphism invariant and since (38a) and (40) must be isomorphic by (41b). By (41c), however, this leads to a contradiction. Thus, $RAF_{English}$ can no longer structurally identify an NP in this nuclear sentence as RA, violating the PRA. Therefore, sentences like (40) are never generable by language learners once they learn the anaphoric dependencies displayed by sentences like (38).

We have shown that the positive data in (38), working jointly with (41b) and (41c), all based on positive data, determine the negative judgement in (40). And we have already noted that the sentences in (34) are not generable without violating the PRA. Let us now consider the contrast between (42a) and (42b):

(42)   a.   Himself$_i$, John$_i$ criticized.
        b.   *John$_i$, himself$_i$ criticized.

Before we explain the above contrast, we note that (38a) and (42a) will be assigned different structures. None of the functions mapping (38a) to (42a) can preserve the

structure of (38a), unless we assume the presence of discontinuous constituents.[10] If no discontinuous constituents are allowed in linguistic description, a structure preserving map will fail to send the VP expression *criticized himself* in (38a) to any appropriate expression in (42a). Even if discontinuous constituents are allowed, it is disputable that the two sentences are isomorphic. One may argue that they are not isomorphic since the linearization of the subject NP and the VP category in (38a) is different from the one in (42a). For these reasons, we assume that they are not isomorphic. The grammaticality of the sentences then suggests that $RAF_{English}$ be given as below:

(43)   For any nuclear sentence S, $RAF_{English}(S)$ = the external NP of S = the NP in [SPEC, IP] of S = the NP interpreted as a nominative extension.

Note again that (43) is an empirical claim based on standard linguistic work which supports the existence of a major constituent break of the form [$_S$ NP [$_{VP}$ V NP]] in English.

We can now infer the ungrammaticality of (42b). Suppose, contrary to fact, that (42b) is grammatical. According to (43), $RAF_{English}$ must identify *John* as an RA NP in (42a), and *himself* as an RA NP in (42b) since (42a) and (42b) must be isomorphic by the assumptions about the structure of English sentences and since $RAF_{English}$ is isomorphism invariant. However, *himself* is not RA, leading to a contradiction. Thus $RAF_{English}$ fails to structurally identify an NP in this nuclear sentence as RA, violating the PRA. Hence, sentences like (42b) are never generable by

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[10]For arguments for discontinuous constituents, see Huck and Ojeda 1987 and references therein.

language learners once they learn the anaphoric dependencies displayed by sentences like (42a).

2.3.2.2. Korean

We will now show how our analysis of English can be extended to Korean. In section 2 of this chapter, we showed that the anaphorically interpreted item *caki* occurs in three different types of binary nuclear sentences, as in (44)-(46).

(44) a. John-i   caki-lul   pinanhay-ss-ta.
             -NOM   self-ACC criticize-PST-DE
             'John criticized himself.'

      b. *Caki-ka John-ul   pinanhay-ss-ta.
            self-NOM   -ACC   criticize-PST-DE
             'He-self$_i$ criticized John$_i$.'

(45) a. Caki-lul John-i   pinanhay-ss-ta.
             self-ACC -NOM   criticize-PST-DE
             'Himself, John criticized.'

      b. *John-ul caki-ka   pinanhay-ss-ta.
                -ACC   self-NOM criticize-PST-DE
             'John$_i$, he-self$_i$ criticized.'

(46) a. John-i   caki-ka   miw-ess-ta.
             -NOM   self-NOM hate-PST-DE
             'John hated himself.'

      b. *Caki-ka John-i   miw-ess-ta.
            self-NOM -NOM   hate-PST-DE
              'He-self$_i$ hated John$_i$.'

The sentences in (44) illustrate the unmarked word order SOV, but the ones in (45), the marked worder order OSV. The sentences in (46) contain double nominative marked NPs. We first show how to derive the ungrammaticality of (44b) from (44a). Consider the following sentences:

(47) a. John-i   Bill-ul   pinanhay-ss-ta.
          -NOM   -ACC   criticize-PST-DE
          'John criticized Bill.'

      b. Sam-i   Frank-lul   pinanhay-ss-ta.
          -NOM   -ACC   criticize-PST-DE
          'Sam criticized Frank.'

An appropriate analysis would assign the two sentences the same structure. As per their English translations, (47a) and (47b) are isomorphic in Korean: there is a structure preserving map *h* which maps the nominative marked *John-i* to the nominative marked *Sam-i*, the predicate *pinanhayssta* 'criticized' to the predicate *pinanhayssta*, and the accusative marked *Bili-ul* to the accusative marked *Frank-lul*. Also, there is a structure preserving map *k* which maps *Sam-i* to *John-i*, *pinanhayssta* to *pinanhayssta*, and *Frank-lul* to *Bill-ul*. Crucial to these structure preserving maps is that case marking is part of structure in Korean--so maps which preserve structure must preserve case markers. The following sentences bear this point out:

(48) a. John-i   wus-ess-ta.
          -NOM   laugh-PST-DE
          'John laughed.'

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b. Joe-ka   wus-ess-ta.
    -NOM   laugh-PST-DE
    'Frank laughed.'

c. *Sam-ul   wus-ess-ta.
    -ACC   laugh-PST-DE
    'Sam laughed.'

There is no doubt that the unary nuclear sentences (48a) and (48b) have the same structure. The independent NPs occurring in these sentences are marked by the same case marker, the nominative marker *-ka* or *-i*. If structure preserving maps could change case markers, a sentence like (48c) would be grammatical. Thus, the ungrammaticality of (48c) confirms us that structure preserving maps must preserve case.

Let us now consider (44a), repeated as (49a).

(49) a. John-i   caki-lul   pinanhay-ss-ta.
      -NOM   self-ACC   criticize-PST-DE
      'John criticized himself.'

    b. $SELF(R) = \{b: bRb\}$, for any binary relation R

    c. $I_j(SELF(CRITICIZE))$ $= I_j(\lambda x[x \ CRITICIZE \ x])$
                             $= \lambda x[x \ CRITICIZE \ x](j)$
                             $= j \ CRITICIZE \ j$

As a matter of empirical fact, *caki* is interpreted as the SELF function in (49b) in sentences like (49a) and hence referentially dependent. Given this, (49a) is assigned the reading in (49c).

We can now infer the ungrammaticality of (44b), repeated as (50), from (51).

(50)　　*Caki-ka　John-ul　pinanhay-ss-ta.
　　　　　self-NOM　-ACC　criticize-PST-DE
　　　　'He-self$_i$ criticized John$_j$.'

(51)　a.　empirically given positive data such as (49a)
　　　b.　assumptions regarding the structure of (47) and (48)
　　　c.　empirically determined interpretation of *caki* in (49b)
　　　d.　PRA

<u>Argument</u>: Suppose, contrary to fact, that (50) is grammatical. Then the referential autonomy function for Korean, *RAF$_{Korean}$*, which must identify *John-i* in (49a) as RA, must identify *caki-ka* in (50) as RA since *RAF$_{Korean}$* is isomorphism invariant and since (49a) and (50) must have the same structure by virtue of (51b). But *caki-ka* is not RA unless it is discourse-bound, as (51c) shows. Thus *RAF$_{Korean}$* fails to structurally identify an NP in this nuclear sentence as RA, violating the PRA. Therefore, sentences like (50) are never possible by language learners once they learn the anaphoric dependencies displayed by sentences like (49a). Thus the negative judgement in (50) is derived entirely from the positive data in (49a) plus (51b) and (51c), all based on positive data.

We have accounted for the contrast between (44a) and (44b) in terms of the PRA plus Korean-specific facts. It seems that our account can be naturally extended to explain why the (b) sentences in (45)-(46) are ungrammatical. Before we proceed, we would like to first make it explicit that (44a) and (45a) are not isomorphic, but (46a) and (46b) are. To this end, we will use an artificial language called Little Korean. That is, Little Korean is made to model the relevant properties of ("Big") Korean above.

The grammar of Little Korean is modelled on that of Little Latin in Keenan and Stabler 1992.

Little Korean is like real Korean in that it is verb-final, the relative order of arguments of two-place predicates P_2 is free preverbally, and grammatical case is overt. NPs combine with case markers to form KPs and it is the latter that function as arguments of predicates. Little Korean has just one lexical anaphor *self* (= *caki*). An "accusative KP," KPa, combines with a P_2 to form a $P1n$, a P_1 which combines with a nominative KP, a KPn, to form an S. Equally, nominative KPs may combine directly with P_2s to form P_1ns or P_1as, the sort of P_1 which combine with an accusative KP to form an S. More formally:

Little Korean $= <V, CAT, LEX, F>$ where,

$$CAT = \{NP, K, KPa, KPn, P_2, P_1a, P_1n, S\}$$
$$V = \{john, bill, self, left, criticized, hated, \text{-}nom, \text{-}acc\}$$
$$LEX = (\{john, bill, self\} \times \{NP\}) \cup (\{left\} \times \{P_1\}) \cup$$
$$(\{criticized, hated\} \times \{P_2\}) \cup (\{\text{-}nom, \text{-}acc\} \times \{K\})$$
$$F = \{CASEMARK, F_1, F_2\} \text{ where}$$

$$CASEMARK(<d, K>, <s, NP> = <sd, KPn> \text{ if } d = \text{-}nom \text{ and } s \neq self$$
$$<sd, KPa> \text{ if } d = \text{-}ac$$

$$F_1(<s, C>, <t, C'>) = <st, S> \text{ if } C = KPa, C' = P_1a,$$
$$\text{or } C = KPn, C' = P_1n$$

$$F_2(<s, C>, <t, P_2>) = <st, P_1n> \text{ if } C = KPa, \text{ or } C = KPn, \text{ or}$$
$$<st, P_1a> \text{ if } C = KPn$$

Little Korean, then, will assign (44a) and (45a) to the analysis trees in (52a) and (52b), respectively.

(52) a.

```
              S
         ┌────┴────┐
       KPn        P1n
      ┌──┴──┐    ┌──┴──┐
     NP     K  KPa     P2
     │      │  ┌─┴─┐    │
    john  -nom NP   K  criticized
              │    │
             self -acc
```

b.

```
              S
         ┌────┴────┐
       KPa        P1a
      ┌──┴──┐    ┌──┴──┐
     NP     K  KPn     P2
     │      │  ┌─┴─┐    │
    self  -acc NP   K  criticized
              │    │
             john -nom
```
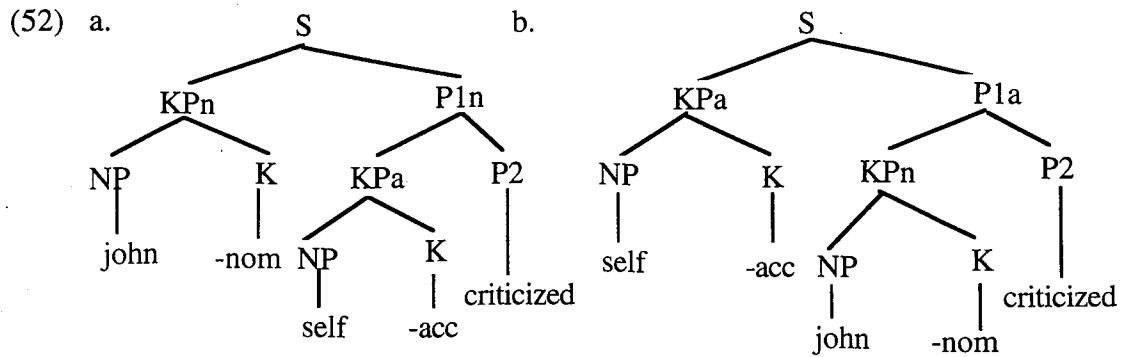
The above analysis trees show that sentences (44a) and (45a) are not syntactically isomorphic since they have VPs of somewhat different categories and one proves for Little Korean that structure preserving maps preserve category. This indicates that the sentences that result from interchanging the case marked NPs are not isomorphic despite the fact that the branching and c-command structure of the trees is the same. So the fact that (44a) and (45a) are both grammatical does not violate the AAU in (13).

According to Little Korean, sentences (46a) and (46b) will be assigned to the tree structures in (53a) and (53b), respectively.

(53) a.

```
              S
         ┌────┴────┐
       KPn        P1n
      ┌──┴──┐    ┌──┴──┐
     NP     K  KPn     P2
     │      │  ┌─┴─┐    │
    john  -nom NP   K  hated
              │    │
             self -nom
```

b.

```
              S
         ┌────┴────┐
       KPn        P1n
      ┌──┴──┐    ┌──┴──┐
     NP     K  KPn     P2
     │      │  ┌─┴─┐    │
    self  -nom NP   K  hated
              │    │
             john -nom
```
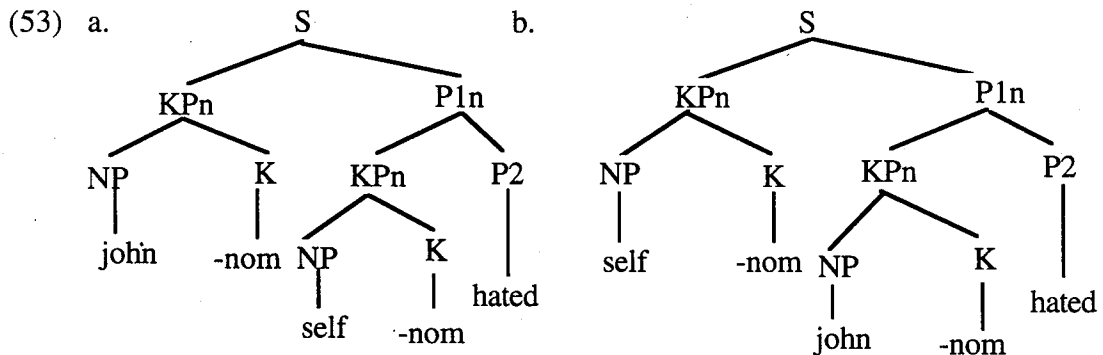
Unlike the previous trees, the trees in (53a) and (53b) are exactly the same, and they are the *only* structures for these strings. They are different only by lexical substitution.

Therefore, in accordance with the AAU, one of the sentences (46a) and (46b) must be ungrammatical. In fact, (46b) is.

Thus far we have shown that merely interchanging the anaphor and antecedent does not give rise to the violation of the AAU and that the AAU effect arises if and only if the sentences that result from interchanging the anaphor and antecedent still preserve the structure of their original sentences. We are now able to infer the ungrammaticality of (45b) and (46b). Based on the grammatical sentences in (44)-(46), we claim that RAF_{Korean} is given by:

(54)   For any nuclear sentence S, $RAF_{Korean}(S)$ = the leftmost NP suffixed with -*ka* or -*i*.

The referential autonomy function RAF_{Korean} (structurally) identifies *John-i* as an RA NP in each of the (a) sentences in (44)-(46). Suppose, contrary to fact, that (45b) and (46b) are grammatical. Then RAF_{Korean} would pick out *caki-ka* 'self-nom' as an RA NP in both (45b) and (46b) since RAF_{Korean} is isomorphism invariant and (45b) and (46b) are isomorphic to (45a) and (46b), respectively. But *caki-ka* is not RA unless it is understood as being discouse-bound. Hence, RAF_{Korean} fails to structurally identify an RA NP in (45b) and (46b), violating the PRA. Therefore, sentences like (45b) and (46b) are never generable once sentences like (45a) and (46a) are empirically given.

2.4. Conclusions

In this chapter we clarified the issue of what it means that anaphors and their antecedents are asymmetrically distributed in basic clause types of a language. Following Keenan (1993), we proposed the Anaphora Asymmetry Universal (13) as the strongest descriptive generalization about the anaphor-antecedent relations in natural languages. We then formulated the Principle of Referential Autonomy (36) in tems of the relational conception of language structure and language invariants proposed by Keenan and Stabler (1992). This principle directly constrains the presence of possible antecedents of anaphors, i.e., RA NPs, rather than the distribution of anaphors themselves. Together with certain language-specific facts that help language learners identify where an RA NP must occur, however, it enables us to derive the claim entailed by the AAU. The above discussion of the English and Korean examples suffices to show how to do so. The logic of argument is the following: If the AAU fails in a given language then the PRA also fails in that language. Therefore, the AAU must hold for the language.

Our account differs from the standard binding theory which stipulates that anaphors must be c-commanded by their antecedent. Unlike the latter, the former does not require that anaphors be c-commanded by their antecedent. In fact, no structural relation is required to hold between anaphors and their antecedents. For a detailed comparison of our approach with others, see section 3.2.1. Our account is based on the notion "structurally identifiable" and the PRA, and hence the determination of well-formed anaphoric relations is dependent upon the positive evidence that language learners may be exposed to. In this respect, we believe, it sheds a new light on our understanding of anaphoric dependencies.

Chapter 3

Further Motivation for the Principle of Referential Autonomy

3.1.   Introduction

In the preceding chapter we proposed the Principle of Referential Autonomy (PRA), which directly constrains the presence of possible antecedents of anaphors, viz., referentially autonomous (RA) NPs in nuclear sentences. The PRA says that for each language L, each nuclear sentence S of L contains at least one independent RA NP and L provides a structurally uniform way of identifying the required RA NP in each S. Limiting ourselves to the minimal transitive context, we argued that if a language L permitted a *symmetric* anaphor-antecedent (AA) relation, L would no longer provide a structurally uniform way of identifying an RA NP in each nuclear sentence in L, violating the PRA.

In this chapter we provide further linguistic motivation for the PRA. In section 3.2 below, we compare our approach with some previously proposed constraints on the AA relation and argue that the former is more conceptually and empirically motivated than the latter. Examination of some of the current approaches to crossover in section 3.3 leads us to claim that the effects of crossover must be ascribed to the principle which is motivated independently from a necessary condition on bound anaphora. We first characterize crossover as another manifestation of the Anaphora Asymmetry Universal (AAU), which says that if an NP A antecedes an anaphor B in a sentence S, then there is no S' syntactically isomorphic to S which replaces A with an

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anaphor *A'* and *B* with an RA NP *B'* understood to antecede *A'*. This enables us to account uniformly for core examples of strong and weak crossover in terms of the PRA. We show that the proposed account is simpler and more descriptively adequate than alternative theories of (weak) crossover.

3.2.   The PRA Revisited

3.2.1.   Cross-Theoretical Remarks on the AAU

In this section we compare our explanation of the AAU with some of the alternative theories of anaphora proposed in the literature. In doing this, we would like to make explicit the following two issues:

(1)   a.   Is there anything that our theory has in common with other general theories of anaphora? If there is, how does the former accommodate what has been (implicitly) assumed by the latter?

   b.   Are they still conceptually different? If so, in what respects? Do they make empirically different predictions? If so, how?

We now briefly review some of the recent treatments of anaphora, especially the ones concerning the asymmetry of the AA relation. We begin with two familiar syntactic conditions. Chomsky's (1981, 1986b) binding theory postulates two principles that govern the distribution of anaphors (R-pronouns). Roughly we may state these principles as follows:

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(2)   Definitions

     a. α is bound by β iff α and β are co-indexed and β c-commands α.

     b. α is free iff α is not bound.

(3)   a.   Principle A: An anaphor must be bound in its governing category.

     b.   Principle C: An R-expression must be free (in the root clause).

Putting aside the locality issue, Principles A is regarded as an axiomatization of the C-Command Condition in (4) below.

(4)   C-Command Condition

Anaphors must be c-commanded by their antecedents.

Within another tradition of syntactic research, an alternative theory of anaphora has been developed. This theory originates in Jackendoff's (1972) pioneering work on argument structure and theta role assignment. Roughly, it relies on the following condition:

(5)   Theta Role Hierarchy Condition (TRHC)

Anaphors may not outrank their local antecedents on the Theta Role Hierarchy:
    Agent, Experiencer > Non-Agent

The form and interpretation of anaphoric dependencies have also intrigued formal semanticists from various frameworks such as Extended Montague Semantics, GPSG, Categorial Grammar, etc. To mention a few, Bach and Partee (1980) and Keenan (1988b, 1989) treat anaphors as functions from binary relations into one-place predicates. Szabolcsi (1989, 1992) identifies them with Curry and Feys' (1958)

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duplicator **W**, interpreted as $\lambda f \lambda x[fxx]$ in bound variable terms. This combinator maps at least two place-functions into one-place functions. In relation to the asymmetry of the AA relation, all of these theories present specific proposals. Bach and Partee (1980) argue that the asymmetry is better accounted for by the function-argument condition in (7).[1]

(6)   Definition

A category α f-commands β iff the first function that contains α', the denotation of α, also contains β', the denotation of β.

(7)   F-Command Condition

Anaphors must be F-commanded by their antecedents.

Szabolcsi (1989, 1992) seems to attribute the asymmetry of the AA relation to a constraint like (8), and Keenan (1988b, 1989) accounts for it in terms of the

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[1]The formulation of the F-Command Condition in (7) is taken from Chierchia 1984. Distinguishing *stipulated coreference* from *binding*, Bach and Partee (1980) gave the two descriptive constraints in (i).

(i)   a.   A pronoun can't be a stipulated coreferent to an NP that occurs in a constituent interpreted as a function with the pronoun as argument.

b.   A pronoun which is interpreted as the argument of a function can't be bound by a quantifier which "came from" a position within the function.

While (ia) blocks the pronoun *he* from being understood as coreferent to the referring NP *John* in (iia), (ib) blocks the pronoun *he* from being understood as bound to the quantified NP *everyone* in (iib).

(ii)   a.   *He$_i$ criticized John$_i$.
        b.   *He$_i$ criticized everyone$_i$.

Here we interpret the term "anaphors" used in (7) to include R-pronouns (reflexives and reciprocals) and pronouns construed as bound variables.

Nominative Reference Condition (NRC) in (9).

(8) Given that no lexical items can be assigned the type that the set of combinators assumed to operate in the syntax of a language cannot derive from the basic set of categories *e* and *t*, do not apply unary composition to the subject NP of category t/(t\e).

(9) In main transitive sentences, a structurally nominative NP is interpreted by a nominative case extension of a basic function (= GQ). An independent NP occurrence is said to be a structurally nominative NP iff its replacement by a basic NP may be interpreted nominatively.

In the above we have enumerated several recent approaches to the asymmetry of the AA relation. By illustrating them one by one, we will unveil one crucial point that they all have implicitly assumed. Consider now the contrast between (10a) and (10b).

(10) a. John criticized himself.
      b. *Himself criticized John.

The standard Binding-Theoretic account relies on the constituent structure that the grammar of English assigns to the sentences. The typical structures to be assigned to these sentences would be like the following:

(11) a. $[_{IP}$ John$_i$ $[_{I'}$ criticized$_j$ $[_{VP}[_{V'}$ t$_j$ himself$_i$]]]]$
      b. $[_{IP}$ himself$_i$ $[_{I'}$ criticized$_j$ $[_{VP}[_{V'}$ t$_j$ John$_i$]]]]$

In (11a) *John* c-commands *himself*, but not vice versa. By the mechanism of free indexing, they may be co-indexed, as in (11a). Then the representation satisfies both

Principles A and C, and thus it gets a well-formed semantic interpretation. By contrast, (11b) violates Principle A since *himself* is not c-commanded by any NP. In fact, the reflexive c-commands the name *John*, violating Principle C. Whether the principles apply at S-Structure or LF does not concern us, and the point to be made remains the same irrespective of which level of representation they apply at.

As we have seen, crucial to this Binding-Theoretic account is the implicit assumption that if (11a) is the only structure available for (10a), (11b) must be the only structure available for (10b). If this assumption fails, the binding theory alone cannot guarantee the ungrammaticality of (10b). In other words, if (10b) were assigned a constituent structure other than (11b), (10b) might be grammatical since the representation of the additional structure could meet both Principles A and C. Therefore, the grammar of English must first guarantee that given (11a), either the structure of (10b) is (11b), or it has no grammatical structure. Note that if (11b) were grammatical, it would be syntactically isomorphic to (11a); they just differ by lexical substitution.

The above discussion suggests that the ungrammaticality of (10b) is not so straightforwardly accounted for as assumed in the GB literature. To account for it, we need to show first that (10b) can have no other than the structure in (11b) if it were grammatical. Then we should show that (11b), the only structure left available, violates Principles A or C. The final conclusion we will get to is: Since (10b) cannot receive any structural analysis, it is not interpreted. Hence it is ungrammatical. This is a complicated story, but the explanation should be the way we suggested.

As with the Binding-Theoretic account, the thematic structure account must also assume that (10a) and (10b) are syntactically isomorphic if the latter were grammatical. In addition, it must assume that the assignment of a theta role is structure-dependent.

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For example, it ought to be supplemented by something like the Uniformity of Theta Assignment Hypothesis advanced in Baker 1985:

(12)   The Uniformity of Theta Assignment Hypothesis

Identical thematic relationships between items are represented by identical structural relationships between those items at D-Structure.

Unless both assumptions are assured, we cannot simply attribute the ungrammaticality of (10b) to the violation of the TRHC (5) since it might be that the *John* in (10a) and the *himself* in (10b) bear different theta roles, or the *himself* in (10a) and the *John* in (10b) bear different theta roles. In order for the TRHC to work, the NPs *himself* and *John* should be assigned the agent and the patient roles in (10b), respectively, just like the NPs *John* and *himself* are assigned the agent and the patient roles in (10a), respectively.

Bach and Partee's (1980) F-Command Condition is based on the insights underlying Keenan's (1974) Functional Principle in (13).

(13)   The Functional Principle

a.   The reference of the argument expression must be determinable independently of the meaning or reference of the functional symbol.

b.   Functions which apply to the argument however may vary with the choice of argument (and so need not be independent of it).

Under Bach and Partee's (1980) account, the functional structures that will be assigned to (10a) and (10b) are roughly the following:

(14) a. (CRITICIZE (HIMSELF)) (JOHN)

  b. (CRITICIZE (JOHN)) (HIMSELF)

In (14a) JOHN, the denotation of *John*, f-commands HIMSELF, the denotation of *himself*. In (14b), however, the latter is not f-commanded by the former since the first function containing the latter does not contain the former. What is crucial to Bach and Partee's account is that (10a) and (10b) have the same structure and that the semantic interpretations of syntactically isomorphic sentences must be computed in a parallel fashion.[2] Again, if (10b) could receive a different structural analysis, the functional structure to be assigned to the sentence might differ from (14b) and perhaps conform to the F-Command Condition.

According to the duplicator analysis of reflexives by Szabolcsi (1989, 1992), sentence (10a) is derived as follows:

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[2]This is why Keenan (1993) claims that the asymmetry of the AA relation follows from the Principle of Compositionality. Note that Keenan takes the more rigorous form of Compositionality in (i) rather than the generally assumed one in (ii).

(i)   A h is a possible interpreting function for a language L iff

  a.   Dom(h) includes L and h assigns to each generating function F a function hF such that:

    Dom(hF) = $\{h(d)|\ d \in$ Dom($F\lceil L$)$\}$ and (hF)(hd) = $h(F(d))$, and

  b.   each syntactic isomorphism μ of L extends to a semantic isomorphism μ_h relative to h as follows:

    Dom(μ_h) = Ran(h) and $\mu_h(h(\sigma))$ = $h(\mu(\sigma))$

(ii)   The meaning of an expression is a function of the meanings of its parts and of the way they are syntactically combined.

(15) John   criticized   himself

      t/(t\e)   (t\e)/e   (t\e)\((t\e)/e)
      __I_j__   λxλy[x LOVE y]   λfλz[fzz]____

                            t\e
                     __λz[z LOVE z]_____

                            t
                        j LOVE j

As mentioned before, Szabolcsi's account of the ungrammaticality of (10b) seems to be

based on a constraint like (8), which prohibits changing the lexical argument structure

of a predicate. If it were not for (8), (10b) could be derived as below:

(16) Himself   criticized   John

      (t/e)/((t\e)/e) (t\e)/e   t\(t/e)
      λfλz[fzz]   λxλy[x LOVE y]   __I_j__

                      t/e
                      __λz[z LOVE z]_____

                            t
                        j LOVE j

Although Szabolcsi (1989, 1992) does not explicitly propose (8), she notes some

disastrous cases that the use of unary composition causes in syntax and suggests that

such unary composition, which changes lexical argument structure, must be banned in

general. Note that the type (t/e)/((t\e)/e) assigned to the nominative anaphor in (16) is

derived by a unary composition applied to the subject NP of type t/(t\e). Since this

lexical type assignment is ruled out by (8), (10b) must have a derivation like the one in

(15) if the sentence were grammatical. But this is impossible since the reflexive

identified as the duplicator *W* must be first combined with the verb. Again, Szabolcsi's

analysis implies that (10a) and (10b) must have the same derivation (or structure) if the latter were grammatical.

Finally, consider the intuitive content of Keenan's (1988b, 1989) NRC (9). As with (8), this condition says that structurally nominative NPs must be referentially autonomous and thus prohibits nominative anaphors. Again, it presupposes that (10a) and (10b) must have the same structure if the latter were grammatical. If *himself* were structurally non-nominative in (10b), which must and can be ruled out independently, the NRC *per se* cannot explain the ungrammaticality of (10b).

As we have seen above, all of the theories considered here must assume or presuppose that (10a) and (10b) have the same structure if a structural analysis were assigned to (10b). Note that this point is exactly what we explicitly stated in terms of our descriptive constraint, the AAU, repeated as (17).

(17)   Anaphora Asymmetry Universal

Let an NP X antecede an anaphor Y in a sentence S. If the result of replacing Y with a referentially autonomous NP Y' and X with an anaphor X' preserves the structure of S, Y' cannot be understood as an antecedent of X'.

In Ch. 2 we showed how to deduce the AAU effects in English and Korean from certain language-specific facts in those languages and the PRA, repeated as (18).

(18)   Principle of Referential Autonomy

For each natural language L, there is an isomorphism invariant function f_L such that

i.   Dom(f_L) includes the nuclear sentences of L, and

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ii. For each nuclear sentence S, $f_L(S)$ is an independent RA NP occurring in S.

Our explanation in terms of the PRA requires that for each ungrammatical string violating the AAU, if it were assigned a structure, there would be a grammatical string that is syntactically isomorphic to it. Suppose (10b) is grammatical. Then we should check whether or not (10a) and (10b) are isomorphic. Independent principles may assure that they are in fact isomorphic. Then, $RAF_{English}$, which must identify *John* as an RA NP in (10a), must identify *himself* as an RA NP in (10b). However, *himself* is not RA, and so we are led to a contradiction. Hence, (10b) violates the PRA since $RAF_{English}$ fails to structurally identify an NP in this nuclear sentence as RA.

The cross-theoretic comparison above suffices to show that some of the basic assumptions in our approach are shared by virtually all other theories of anaphora. At this point, it seems natural to ask whether there is any difference between the approach taken here and the others. Although they share some crucial points, they are conceptually different. The C-Command Condition (4), the TRHC (5), and the F-Command Condition (7) directly constrain the distribution of anaphors by making reference to anaphors in their formulation. By contrast, Szabolcsi's condition (8) and the NRC (9) do not directly constrain the distribution of anaphors: the former constrains combinatory operations and the lexical assignment of types, and the latter, the distribution of RA NPs. As mentioned, the PRA is designed to originally constrain the presence of possible antecedents of anaphors (RA NPs). Therefore, the PRA is on a par with (8) and (9) in that they do not directly constrain the distribution anaphors. Nonetheless, the PRA differs from (8) and (9). Unlike (8) and (9), the PRA does not need to assume that each lexical assignment of a type is conditioned by the expressive

power of the combinators used in syntax or that any pretheoretical notion of "subject" or "nominative" applies uniformly in languages with different structures. Nor does the PRA require the AA relation to form a certain syntactic configuration, as in the binding theory, or to disclose a hierarchy among theta roles, as in the thematic account. Nor does it require that the function-argument structures for basic clause types of sentences in one language be the same in another language, as in the Extended Montague semantics. In short, our principle is free from any particular configurational notion, thematic structure, grammatical function, or semantic structure; it depends only on the notion of "same" structure. So in that sense, our theory is more abstract and general than any of its alternatives.

The fact that our theory is more conceptually general suggests that it may provide a natural account of where the alternative theories run into difficulties. In fact, there are some cases where our theory makes empirically better predictions. This is what we will show in the next section.

3.2.2. More Empirical Justification of the PRA

In formulating the PRA, we showed that the mechanisms of structurally identifying the required RA NP in each nuclear sentence need not be given in terms of syntactic hierarchy or any other grammatical notions. Our formulation is based on the hypothesis that different languages combine lexical items in different ways.

In Ch. 2 we already discussed the examples that support the hypothesis. Let us consider the following Batak sentences again:

(19)   a.   Mang-ida dirina   si   Torus.
              sees   self-his ART
              'Torus sees himself.'

        b.   Di-ida si Torus dirina.
              saw   ART   self-his
              'Torus saw himself.'

        a'. *Mang-ida si Torus dirina.
              sees   ART   self-his
              'He-self$_i$ sees Torus.'

        b'. *Di-ida dirina   si   Torus.
              saw   self-his ART
              'He-self$_i$ saw Torus.'

It was noted that whether the verb is prefixed with *mang-* or *di-*, the verb forms a constituent with the immediately following NP. The binding theory based on the C-Command Condition (4) makes accurate predictions in the case of the *mang*-prefixed verb, but inaccurate ones in the case of the *di*-prefixed verb.

The following Samoan examples give further support to our hypothesis:[3]

(20)   a.   E   vivi'i e   le   tama 'o ia lava.
              ASP praise ERG ART boy   ABS 3s self
              'The boy praises himself.'

        b. E   vivi'i le   tama e   ia lava.
              ASP praise ART boy   ERG 3s self
              'He-self$_i$ praises the boy$_i$.'

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[3]All of the Samoan examples cited below are taken from Keenan 1991.

c. Na lavea le tamaititi iate ia lava.
    PST hurt ART child DIR+3s self
    'He-self$_i$ hurt the child$_i$.'

a'. *E vivi'i 'o ia lava e le tama.
    ASP praise ABS 3s self ERG ART boy
    'The boy praises himself.'

b'. *E vivi'i e ia lava le tama.
    ASP praise ERG 3s self ART boy
    'He-self$_i$ praises the boy$_i$.'

c'. *Na lavea 'i le tama 'o ia lava.
    PST hurt DIR ART boy ABS 3s self
    'The boy wounded himself.'

(20a) illustrates the basic word order in Samoan, VSO; (20b) with VOS word order is an easy alternate. In both (20a) and (20b), anaphors follow their antecedents. The ungrammaticality of (20a') and (20b') shows that anaphors may not precede their antecedents. As in (20c), verbs like *lavea* 'hurt' are immediately followed by the subject unmarked and the non-subject marked with the locative *'i*. In this sentence the unmarked subject NP, interpreted as Theme, antecedes the locative reflexive, interpreted as Agent. The ungrammaticality of (20c') indicates that the *-i* marked NP cannot antecede an anaphor.

To account for the above anaphora paradigm, Keenan (1991) proposes the following language-specific constraint:

(21) Samoan Anaphora Constraint (SAC)

In binary nuclear Ss an NP *A* may be interpreted as the antecedent of an anaphor *B* iff *A* precedes *B* and *A* is not *i*-marked (= locatively marked).

Keenan observes that the TRHC (5) cannot derives the SAC above. In (20b) and (20c) the NPs interpreted as Agent are occupied by the reflexive, violating the TRHC. Nonetheless, they are grammatical. This clearly shows that the TRHC is not universally defensible.

Below we argue that the other alternative theories also fail to explain the SAC. It is not clear at all how they can handle the anaphora paradigm in (20). First of all, it is not easy to motivate the structure in which the AA relation in (20a) conforms to the C-Command Condition. Suppose the grammar of Samoan is so designed as to allow that kind of structure. Even so, it will turn out more difficult to motivate the structure in which the AA relations in (20b) and (20c) conform to the C-Command Condition. Given the Samoan examples, it seems too premature to claim the C-Command Condition to be a universal constraint on the AA relation. It is also questionable that any pretheoretical notion of "subject" or "nominative" referred to in "accusative" languages like English uniformly applies to "nonaccusative" languages like Samoan too. Even if we consider only (20a) and (20b), which NPs correspond to what we might pretheoretically call "subject" in English is a tough (and almost impossible) question to answer. Inasmuch as Szabolcsi 1989, 1992 and Keenan 1988b, 1989 exploit this universally nondefinable notion in some way or another, they may be viewed as insufficient to be a universal account. In order to apply the F-Command Condition of Bach and Partee (1980), we must assume that the grammatical sentences in (20a-c), repeated as (22), are assigned their respective functional structures in (23).

(22)   a.   E   vivi'i e   le   tama 'o   ia lava.
            ASP praise ERG ART   boy   ABS 3s self
            'The boy praises himself.'

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b. E vivi'i le tama e ia lava.
ASP praise ART boy ERG 3s self
'He-self$_i$ praises the boy$_i$.'

c. Na lavea le tamaititi iate ia lava.
PST hurt ART child DIR+3s self
'He-self$_i$ hurt the child$_i$.'

(23) a. (e vivi'i ('o ia lava)) (e le tama)
b. (e vivi'i (e ia lava)) (le tama)
c. (na lavea (iate ia lava)) (le tamaititi)

Bach's (1976) rule-to-rule hypothesis requires that the above functional structures be derived from the syntactic structures containing discontinuous constituents. For example, in (22a), the NP marked by the ergative *e* splits the constituent to be formed by the verb *e vivi'i* and the reflexive *'o ia lava*. An alternative way of interpreting the sentences in (22) is to assign syntactically and semantically flat structures to these sentences. Although our explanation of the Samoan anaphora paradigm is based on the latter position, our primary concern here is not which is the better analysis. All we want to point out is that in order to rule out the ungrammatical strings (20a'-c') in terms of the F-Command Condition, Bach and Partee's analysis must presuppose the existence of discontinuous constituents in Samoan, which must be supported independently.

We have so far shown that the binding theory and its alternatives encounter many perplexing difficulties in explaining data from Toba Batak and Samoan. Below we suggest an analysis that explains the anaphora paradigm presented by these data, given the minimal assumptions about Batak and Samoan. We begin with the Batak sentences. Recall that the verb forms a constituent with an adjacent NP whether it is prefixed with *mang-* or *di-*. That is, the Batak transitive sentences have the form:

(24)   [[pref-V NP$_1$] NP$_2$] where pref is *Mang-* or *Di-*

Given (24), we propose that the referential autonomy function for Batak, RAF_{Batak}, be given by:

(25)   For any binary nuclear sentence S, $RAF_{Batak}(S)$ = NP$_2$ in (24) if S is headed by a *mang*-prefixed verb, or NP$_1$ in (24) if S is headed by a *di*-prefixed verb.

Here we assume that verbal affixation is crucial to the structure of the Batak sentences. More specifically, we treat the grammatical sentences in (19), repeated as (26a) and (26b), as having different structures.

(26)   a.   Mang-ida dirina   si   Torus.
               sees   self-his   ART
               'Torus sees himself.'

         b.   Di-ida si Torus   dirina.
               saw   ART   self-his
               'Torus saw himself.'

        a'.   *Mang-ida si Torus   dirina.
              sees   ART   self-his
              'He-self$_i$ sees Torus.'

        b'.   *Di-ida dirina   si   Torus.
              saw   self-his   ART
              'He-self$_i$ saw Torus.'

The constituency requirement in (24) might suggest that (26a) and (26b) have the same tree structure, but it DOES NOT guarantee that they are syntactically isomorphic. In

relation to this, it is worth noting that Szabolcsi (1990) treats *mang-ida* as a verb of type (t/e)/e but *di-ida* as a verb of type (t/((t/e)\((t/e)/e)))/e, as in (27).

(27) a. Mang-ida   dirina   si   Torus

            (t/e)/e   (t/e)\((t/e)/e)   e

            $\underline{\lambda x \lambda y[SEE(x)(y)]}$ $\underline{\lambda f \lambda z[fzz]}$ $\underline{\quad t \quad}$

                          t/e

                       $\underline{\lambda z[SEE(z)(z)]\qquad\qquad\qquad\qquad}$

                             t

                     SEE(*t*)(*t*)

    b. Di-ida   si Torus   dirina

            (t/((t/e)\((t/e)/e)))/e   e   (t/e)\((t/e)/e)

            $\underline{\lambda x \lambda k[k(SEE)(x)]}$ $\underline{\quad t \quad}$ $\underline{\lambda x \lambda y[SEE(x)(y)]}$

                t/((t/e)\((t/e)/e))

                $\underline{\lambda k[k(SEE)(t)]\qquad\qquad\qquad\qquad}$

                          t

                     SEE(*t*)(*t*)

In addition to the derivational difference shown in (27), the fact that (26a') and (26b') are ungrammatical clearly shows that (26a) and (26b) are not isomorphic. If they are isomorphic, there is no reason that (26a') and (26b') are ungrammatical, and it will be incorrectly predicted that (26a') and (26b') are isomorphic to (26b) and (26a), respectively.

By virtue of (25), *RAF*_{*Batak*} structurally identifies *si Torus* as an RA NP in both (26a) and (26b), as we show succinctly in (28).

(28)   *RAF*_{*Batak*}(26a) = *RAF*_{*Batak*}(26b) = *si Torus*

We are now able to account for the ungrammaticality of (26a') and (26b'). Suppose, contrary to fact, that they are grammatical. Then RAF_{Batak} would incorrectly identify *dirina* 'self-his' as an RA NP in (26a') and (26b'), since RAF_{Batak} is isomorphism invariant and since (26a') and (26b') must be isomorphic to (26a) and (26b), respectively.[4] Since *dirina* is not RA, this would then result in a violation of the PRA. Since the PRA is inviolable, we must abandon our initial assumption that (26a') and (26b') are grammatical. Once we learn the AA relations coded by (26a) and (26b), we do not have any chance to generate sentences like (26a') and (26b'), without violating the PRA.

An alternative account of the Batak anaphora paradigm has been advanced by Clark (1991). His modular theory of coreference (binding, in our term) consists of three components:

(29) a. a binding theory based on syntactic relation
      b. an interpretive theory of the denotations of arguments
      c. a theory of predicate-argument structure

The binding theory makes reference to relations defined on constituent structure to

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[4] A few words are in order about one minor technical point. If the NP dominating *si Torus* branches, but if the NP dominating *dirina* does not branch, there is no hom that maps the former to the latter, even though there may be a hom that maps the latter to the former. So, technically speaking, (26a) and (26b) cannot be isomorphic to (26a') and (26b'), respectively, even if we assume the latter strings are grammatical. To avoid this problem, one may assume that the NP dominating *dirina* also dominates the empty article corresponding to *si*. Then, the NP branches and thus are isomorphic to the NP dominating *si Torus*. Alternatively, one may hold that the NP dominating *si Torus* does not branch but that the article *si* is inserted by a lexical spell-out rule. On this view, the NP dominating *si Torus* is "syntactically" isomorphic to the non-braching NP dominating *dirina*. We will not pursue the exact mechanisms of guaranteeing the isomorphism between the two NPs. Instead we will simply assume that they are mapped to each other by a structure preserving map.

derive a set of possible binding pairs of the form:

(30)   <binder, bound element>

The interpretive theory checks whether each member of such a pair has an appropriate type of denotation to be coindexed with the other. The theory of predicate-argument structure guarantees that no element binds an argument outside of its predicate.

Following Schachter (1984) and Keenan (1988b, 1989), Clark assumes that both *mang-* and *di*-prefixed verbs project the same constituent structure:

(31) $[_{V}^{max} [_{V'}$ pref-V $NP_1] NP_2]$ where pref is *Mang-* or *Di-*

Clark treats the verb *ida* 'see', whether it is prefixed with *mang-* or *di-*, as a two-place predicate which maps a Theme argument to an one-place predicate. This one-place predicate then maps an Experiencer argument to a truth value. Given Clark's structural assumption, either of the NPs in (31) m-commands the other. Thus, for each of the sentences above, the structural relation of binding admits two possible pairs, <si Torus, dirina> and <dirina, si Torus>. Then the theory of predicate-argument structure guarantees that only <si Torus, dirina> is a possible binding pair for (26a) and (26b), since *dirina* bears a Theme role in both sentences and the Theme argument is assumed to be first combined with the verb *ida*, whether it is prefixed with *mang-* or *di-*. Hence, the two sentences obey Principles A and C in (32).

(32)   a.   Principle A: Anaphors must be bound in their minimal syntactic domain.

b. Principle C: An R-expression may not be bound by an expression which lacks inherent reference.

In the case of the ungrammatical strings (26a') and (26b'), however, the theory of predicate-argument structure allows only <dirina, si Torus> to be a possible binding pair for the reason mentioned above. But this pair ends up with *dirina*'s binding of *si Torus*, violating Principle C.

It appears that Clark's modular approach to coreference (binding) adequately explains the Batak anaphora paradigm. However, this is possible only when the Principle of Compositionality is abandoned. On his account the function-argument structure is not determined by the constituent structure in (31) that he assumes the sentences to have, but by the theta-grid of the predicate *ida*, as borne out by the following:

(33) a. $[_{V^{max}}[_{V'}$ Mang-ida dirina] si Torus]
                  saw   self-his ART
          'Torus saw himself.'
      a'. (mang-ida(dirina))(si Torus)

      b. $[_{V^{max}}[_{V'}$ Di-ida si Torus] dirina]
                  saw   ART   self-his
          'Torus saw himself.'
      b'. (di-ida(dirina))(si Torus)

The function-argument structure (33a') accords with the constituent structure (33a), but the function-argument structure (33b') does not accord with the constituent structure (33b). Given the Principle of Compositionality, it is not possible to derive (33b') from (33b). In fact, (33b) is not compatible with his assumption that whether it is prefixed

with *mang-* or *di-*, the verb maps a Theme to an one-place predicate. The way he interprets the sentences contradicts the structure in (31), which he tries to vindicate.

We provided an analysis on which the Batak anaphora paradigm is explained in terms of the PRA plus certain Batak-specific facts and showed that it is superior to Clark's (1991) modified binding theory. As we will see, our approach to the asymmetry of the AA relation also provides a natural account of the Samoan anaphora paradigm. Let us consider the Samoan examples in (20), repeated as (34).

(34) a. E   vivi'i e   le   tama 'o ia lava.
            ASP praise ERG ART boy   ABS 3s   self
            'The boy praises himself.'

      b. E   vivi'i le   tama e   ia lava.
            ASP praise ART boy ERG 3s   self
            'He-self$_i$ praises the boy$_i$.'

      c. Na lavea le   tamaititi iate ia lava.
            PST hurt ART child   DIR+3s self
            'He-self$_i$ hurt the child$_i$.'

      a'. *E   vivi'i 'o ia lava e   le   tama.
            ASP praise ABS 3s   self   ERG ART boy
            'The boy praises himself.'

      b'. *E   vivi'i e   ia lava le   tama.
            ASP praise ERG 3s   self   ART boy
            'He-self$_i$ praises the boy$_i$.'

      c'. *Na lavea 'i le   tama 'o ia lava.
            PST hurt   DIR ART boy ABS 3s self
            'The boy wounded himself.'

We assume that the case marking paradigm displayed by the post-verbal NPs

determines the structure of the sentences in question. This means that each of the grammatical sentences in (34) has a different structure from the others. We also assume that a VSO language like Samoan differs from an SOV language like Korean in that interchanging the two post-verbal NPs does not change the structure of sentences. Then it follows that (34a) and (34b) would be isomorphic to (34a') and (34b'), respectively, if the latter strings were grammatical. This stipulated isomorphism implies that each of the former sentences has the flat sentence structure.

Given the grammatical sentences in (34), we propose that the referential autonomy function for Samoan, RAF_{Samoan}, be given by (35).

(35)   For any binary nuclear sentence S, $RAF_{Samoan}(S)$ = NP adjacent to the verb.

By virtue of (35), we are led to have the following:

(36) RAF_{Samoan}(34a) = *e le tama*; RAF_{Samoan}(34b) = *le tama*; RAF_{Samoan}(34c) = *le tamaititi*

As with Batak, we can now infer the ungrammaticality of (34a') and (34b') from the PRA and some relevant assumptions about the grammar of Samoan. Suppose, contrary to fact, that (34a') and (34b') are grammatical. Then RAF_{Samoan} would incorrectly identify *'ole ia lava* 'self-his' as RA NPs in (34a') and (34b'), respectively, since RAF_{Samoan} is isomorphism invariant and since (34a') and (34b') are assumed to be isomorphic to (34a) and (34b), respectively. But *'ole ia lava* are not RA. Hence RAF_{Samoan} fails to identify an NP as RA in (34a') and (34b'), yielding the violation of the PRA. Since the PRA is inviolable, we must abandon our initial assumption that

they are grammatical. Once we learn the AA relations coded by (34a) and (34b), we will never generate sentences like (34a') and (34b').

Although we succeed in explaining the ungrammaticality of (34a') and (34b'), we have not completely derived the SAC (21) yet. The ungrammaticality of (34c') should be explained. Pending further work, the present analysis suggests that even if we assume (34c') is grammatical, it cannot be isomorphic to (34c). The string that we think is isomorphic to the latter would be:

(37)   Na   lavea iate ia   lava le   tamaititi.
       PST hurt   DIR+3s self ART child
       'He-self_i hurt the child_j.'

Our analysis correctly predicts that (37) is ungrammatical with the locatively marked *iate ia lava* being anteceded by the unmarked *le tamaititi*. This suggests that the ungrammaticality (34c') is independent from the grammaticality of (34c). We must find the independent reason why it is ungrammatical. Fortunately, it is not so difficult to find. Keenan (1993) notes that even in sentences like (38) below, which contain only RA NPs:

(38)   a.   Na   lavea le   teine 'i   le   tama.
            PST hurt   ART girl DIR ART boy
            'The boy hurt the girl.'

       b.   ??Na lavea 'i   le   tama le   teine.
              PST hurt   DIR ART boy   ART girl
            'The boy hurt the girl.'

it is unnatural for the *'i* marked NP to preceed the unmarked NP, as shown by the

contrast between the two sentences.

Thus far we have argued that our explanation of the AAU is empirically favorable to the current theories that deal with the asymmetry of the AA relation. In the remainder of this section, we will present further advantage of our approach. As we mentioned before, the C-Command Condition (4), the TRHC (5), and the F-Command Condition (7) are designed to constrain the distribution of anaphors directly by making reference to anaphors in their formulation. Roughly speaking, these conditions constrain the relation between anaphors and their "possible" antecedents. Furthermore, the binding theory incorporating (4) and (5) make direct reference to "locality" in some way or another. By contrast, condition (8) and the NRC (9) are designed not to directly constrain the distribution of anaphors. In consequence, their analyses are free from the notion of locality. Our PRA is on a par with (8) and (9) in that it does not constrain the distribution anaphors directly or make reference to locality.

We first argue that the anaphora conditions that constrain the relation between anaphors and their "possible" antecedents must avoid using the term "antecedent" in their formulations. Let us consider (3a), (5), and (7), repeated as (39).

(39)   a.   An anaphor must be bound in its governing category.

       b.   Anaphors cannot outrank local antecedents on the Theta Role Hierarchy:
            Agent, Experiencer > Non-Agent

       c.   Anaphors must be F-commanded by their antecedents.

A rigorous interpretation of Principle A of the binding theory in (39a) says that if an expression α is an anaphor, there must be β such that β c-commands and has the same index as α in α's governing category. As we can see, no reference to the notion of

antecedent is made in (39a).[5] The formulations of the TRHC in (39b) and the F-Command Condition in (39c) are somewhat misleading for the following reasons. First, it is not clear whether (39b) means that for each anaphor α, there must be a local antecedent β such that β outranks α on the Theta Role Hierarchy or that for each anaphor α, if β is a local antecedent of α, β outranks α on the Theta Role Hierarchy. Nor is it clear whether (39c) means that for each anaphor α, there must be an antecedent β such that β f-commands α or that for each anaphor α, if β is an antecedent of α, β f-commands α. Moreover, there is certain circularity involved in their formulation. Note that the expression *α is a (local) antecedent of β* makes sense only when it is applied to grammatical AA relations. But whether α is a (local) antecedent of β is dependent upon whether the relation between α and β conforms to what (39b) and (39c) are intended to express. To overcome the circularity problem, we reformulate (39b) and (39c) as follows:

(40)　a.　For each anaphor α, there must be an NP β such that (i) β is a coindexed coargument of α, and (ii) β outranks α on the Theta Role Hierarchy.

　　　b.　For each anaphor α, there must be an NP β such that (i) β is coindexed with α, and (ii) β f-commands α.

　　　a'.　For each anaphor α, if β is a coindexed coargument of α, β outranks α on the Theta Role Hierarchy.

　　　b'.　For each anaphor α, if β is coindexed with α, β f-commands α.

Whereas (40a) and (40b) are the existential interpretations, (40a') and (40b') are the conditional interpretations. The notion of antecedent is now eliminated from both

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[5]Note also that conditions (8) and (9) and the PRA do not use the notion of antecedent either.

interpretations of the reformulated TRHC and F-Command Condition.

Although these two interpretations make the same predictions in most cases, there are certain cases where they make different predictions. Consider the following ungrammatical strings:

(41) a. *[This picture of himself] sells well.
      b. *[Both himself and Mary] snored.
      c. *[No one but himself] criticized John.

In (41a) and (41b) there is no NP that can be coindexed with the reflexive *himself* by virtue of the *i*-within-*i* condition and a general principle of agreement. The fact that no NP can be coindexed with *himself* in (41a) and (41b) renders the two interpretations of the TRHC and the F-Command Condition to make different predictions. While the existential interpretations (40a) and (40b) correctly rule out (41a) and (41b), the conditional interpretations (40a') and (40b') incorrectly rule them in. In (41c) nothing prevents *himself* from being coindexed with *John*. Suppose these two NPs are coindexed. *John* is not a coargument of *himself*, yielding the violation of (40a). But coindexing the two NPs makes (41c) satisfy (40a') vacuously. The denotation of *John* fails to f-command the denotation of *himself*, yielding the violation of (40b). Since the denotation of *John* fails to f-command the denotation of *himself*, (40b') is also violated. As we have seen, the conditional interpretation of the TRHC inaccurately predicts that the strings in (41) are all grammatical, and the conditional interpretation of the F-Command Condition gives incorrect results in (41a) and (41b). This forces us to abandon the conditional interpretations (40a') and (40b'). In fact, it is the existential interpretations that directly express our pretheoretical intuition that anaphors must be bound or that the sentence must contain something that can bind an anaphor. It is

worthy of note that Jackendoff's (1972:115) well-formedness condition in (42) is in accordance with our existential interpretation of the TRHC.

(42)   Requirement that reflexives have antecedents

For every reflexive R in a sentence, there must exist an entry in the table of coreference of the form X *coref* R, where X is some other NP in the sentence.

In what follows, we will argue that Principle A of the binding theory (39a) is insufficient to express the above-mentioned intuition. Chomsky (1981) defines the notion "governing category" mentioned in (39a) as follows:

(43)   a. α is a governing category for β iff α is the minimal category containing β, a governor of β, and a SUBJECT accessible to β.

   b. α is accessible to β iff β is in the c-command domain of α and assignment of the index of α to β would not violate the *i*-within-*i* condition in (43c).

   c.   *$[_\gamma ... \delta ...]$, where γ and δ bear the same index.

By assumption, in the sentences in (41), Agr is obligatorily coindexed with the subject NPs that contain *himself*. Then coindexing Agr with the reflexive violates (43c). Since no SUBJECT is accessible to the reflexive *himself*, there is no governing category for it. Therefore, in order to block Principle A from being vacuously satisfied in (41), the theory must stipulate an additional condition like (44).

(44)   A root sentence is a governing category for a governed element.

No NP binds *himself* in the root clauses of the strings in (41). Hence, in accordance with (44), Principle A correctly rules out all of the strings in (41).[6] The problem we point out here is how well (44) is motivated and how to discriminate between (43a) and (44) and eliminate the redundancy that the two definitions may have. In any rate, we need to clarify these issues to rule out sentences like (45).

(45)   *John$_i$ said that Mary criticized himself$_i$.

According to the definition in (43a), the complement clause is a governing category for *himself*. In that clause it is not bound, violating Principle A. If we adopt the definition in (44), however, only the root clause counts as a governing category for it. In that category it is bound by the matrix subject NP *John*. Nevertheless, the sentence is ungrammatical. In order to handle this problem, we need to put some qualification on (44).

James Huang (personal communication) points out to me that the above problem may be avoided by what Lasnik (1989) considers to be an alternative to (44):

(46)   A root sentence is a governing category for an element that otherwise has no governing category.

Given (46), only the complement clause counts as a governing category for *himself*, as desired. However, as Lasnik himself points out, (46) gives rise to a new problem. It

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[6]It is not yet clear how the reflexive *himself* contained in the coordinate NP in (41b) is governed. An appropriate definition of government should allow INFL to govern the whole coordinate NP, but not its conjuncts. Otherwise, extraction from a coordinate NP structure cannot be blocked, a disastrous result.

has the consequence that PRO is never possible or the PRO theorem must be abandoned. Since PRO is both anaphoric and pronominal, it must obey Principle A and Principle B simultaneously. But no element can be bound and free in the same domain. So the only way out of the dilemma is what is now called the PRO theorem that PRO is ungoverned. According to this theorem, no governing category for PRO is defined, rendering PRO to vacuously satisfy Principles A and B. Given (46), however, PRO would invariably have a governing category, the root clause. Like other elements, PRO cannot be bound and free in the root clause. Therefore, PRO, as lexically specified as [+anaphoric, +pronominal], cannot be licensed at all unless (46) is abandoned. The above discussion shows that there is no simple way to avoid the problem of "ambiguous" governing category.

One may propose to replace (46) with (47).

(47)   A root sentence is a governing category for a *governed* element that otherwise has no governing category.

(47) will avoid the PRO problem and correctly rule out not only sentences like (45) but also sentences like (41). Despite its descriptive correctness, (47) is still stipulative and its existence is doubtful. Why the theory needs the two intrinsically different definitions of governing category remains and will continue to be unaccounted for.

It seems to me that the ungrammaticality of (41) illustrates the most fundamental property of anaphors that they must be bound in the sentence. Put differently, there must be a possible antecedent for an anaphor in the sentence. Recall the well-formedness condition (42). Being bound in a local domain cannot be characteristic of anaphors unless the ungrammaticality of (41) is adequately explained by this

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characterization. Any attempt to formulate *being bound in a local domain* in terms of governing category or other similar notion may fail to incorporate the basic property of anaphors that the strings in (41) have illustrated, as long as the local domain for an anaphor is assumed to include a possible antecedent for that anaphor.

Chomsky (1986b) argues that (44) is dispensable. He proposes the licensing condition in (48).

(48) a. A category α governed by γ in the expression E with indexing I is licensed if for some β such that (i) holds, I is BT-compatible with (α, β):

      i. α is an anaphor or pronominal and β is the least CFC containing α for which there is an indexing J BT-compatible with (α, β)

    b. Indexing I is BT-compatible with (α, δ) if α is an anaphor and bound in δ under I.

Let us now consider the ungrammatical string in (49).

(49) *Himself laughed.

According to (48b), there is no indexing I BT-compatible with the pair *himself* and the root clause of (49). Since the antecedent clause of (48a) is false, the reflexive pronoun *himself* in (49) satisfies the licensing condition vacuously. Therefore the binding theory *per se* cannot rule out (49). On independent grounds, Chomsky (1986b) assumes that anaphors raise at LF. Suppose *himself* is moved to I', as in (50), or some designated A' position at LF.

(50) $[_{IP}\ t_i\ [_{I'}\ himself_i + laughed_j\ [_{VP}\ t_j]]]$

In (50), then, the trace t_i is not theta-governed or antecedent-governed, violating the Empty Category Principle (ECP).

Contrary to Chomsky's claim, however, the ECP cannot dispense with the stipulative condition (44). By way of illustrating this point, let us consider (41a), repeated as (51a), and its LF representation (51b).

(51)   a.   [This picture of himself] sells well.
       b.   [$_{IP}$[$_{NP}$ this picture of t_i] [$_{I'}$ himself$_i$ + sell$_j$+s [$_{VP}$ t_j] well]]

As with (49), no BT-compatible indexing is assigned to (51a). Thus it vacuously satisfies Principle A. In (51b) the trace t_i, left behind by the LF-raising of *himself*, fails to be antecedent-governed, but it is theta-governed by the preposition *of*, obeying the ECP. Therefore, nothing in Chomsky's (1986b) theory rules out an ungrammatical string like (51a).

We have shown that the ECP is not responsible for the ungrammaticality of the strings in (41). To block those strings, the binding theory must be supplemented by the *ad hoc* stipulation (47).[7] This means that Chomsky's (1981, 1986b) binding

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[7]James Huang (personal communication) suggests that the problem posed by (41) may be avoided if the licensing condition (48a) is given in the biconditional form, as below:

(i)   A category α governed by γ in the expression E with indexing I is licensed **iff** for some β such that (i) holds, I is BT-compatible with (α, β):

       i. α is an anaphor or pronominal and β is the least CFC containing α for which there is an indexing J BT-compatible with (α, β).

This biconditional restatement, however, cannot solve the problem. To check whether (i) is met, one should be able to verify the argument clauses of (i). But there is no way to do so. As illustration, consider (51a). As we discussed before, (51a) meets the right-to-left direction of (i). Then we are stuck at this point. We can no longer verify

theory is not adequate to derive the basic property of anaphors that there must be a possible antecedent for an anaphor in the sentence. The deficiency we noted here persists even in its alternative theory advanced in Pollard and Sag 1992 and its reformulated version developed in Reinhart and Reuland 1991 and Reuland and Reinhart 1991.

The two theories support the long-standing observation that there is no single principle or constraint that governs all occurrences of anaphors in English. More specifically, Ross 1970, Postal 1971, Jackendoff 1972, Kuno 1972, 1987, Lebeaux 1985, and Keenan 1988a present examples like (52), in which Principle A of the binding theory is systematically violated.

(52) a. $John_i$ had worked hard to make sure that twins would be well taken care of. As for $himself_i$, it was relatively unlikely that anyone would be interested in hiring an ex-convict who had little in the way of professional skills. (Ross 1970)

b. The fact that there is a picture of $himself_i$ hanging in the post office is believed (by Mary) to be disturbing Tom_i. (Jackendoff 1972:137)

c. $John_i$'s campaign requires that pictures of $himself_i$ be placed all over town. (Lebeaux 1985:358)

d. They made sure that nothing would prevent each $other_i$'s pictures from being put on sale. (Kuno 1987:95)

e. Each $student_i$ was confident that the teacher would criticize everyone but $himself_i$. (Keenan:1988a)

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whether it meets the left-to-right direction, since we do not know whether *himself* is licensed in (51a) or not. In other words, we must know whether (51a) is grammatical or not before we check whether (51a) meets the condition (i). But whether (51a) is grammatical or not depends just on whether it meets the condition in consideration.

(52a) illustrates the discourse-binding of *himself*, the existence of which Principle A denies. (52b-d) are taken to show that "picture noun" anaphors are not generally subject to Principle A. (52e) shows that not only such picture noun anaphors but other referentially dependent NPs like *everyone but himself* are exempt from Principle A.

Assuming that anaphors like those in (52) must be treated by other discourse and processing constraints, Pollard and Sag (1992) propose to formulate Principle A as in (54) in terms of relational superiority defined in (53).

(53)   a. α *locally o(bliqueness)-commands* β iff the content of α is a referential parameter and there is a SUBCAT list on which α precedes β.

        b. α *locally o-binds* β iff α and β are coindexed and α *locally o-commands* β. If β is not locally o-bound, then it is said to be *locally o-free*.

(54)   Principle A

A locally o-commanded anaphor must be locally o-bound.

Some remarks are in order. All NPs but expletives like *it* and *there* have a referential parameter. Roughly the SUBCAT list of a predicate contains all maximal projections subcategorized for by that predicate plus its subject NP. The NPs in a SUBCAT list are ordered in terms of their relative obliqueness: if α is less oblique than β, then α precedes β. As illustration, let us consider how to account for the asymmetry of the AA relation illustrated in (10), repeated as (55).

(55)   a.   John$_i$ criticized himself$_i$.
        b.   *Himself$_i$ criticized John$_i$.

According to Pollard and Sag 1992, the verb *criticize* is assigned a SUBCAT list of the

form <NP, NP>. The second NP corresponds to the verb's object, and the first NP, the verb's subject. In (55a), *John* locally o-commands *himself* since it has a referential parameter and precedes the reflexive in the SUBCAT list. Moreover, it locally o-binds the reflexive, obeying (54). Thus Principle A in (54) correctly accounts for the fact that anaphors must be bound in sentences like (55a). However, it cannot account for the ungrammaticality of (55b). Since the reflexive pronoun in (55b) is not locally o-commanded, it must be treated as an exempt anaphor like those in (52). So it is not subject to (54). Pollard and Sag attribute its ungrammaticality to a violation of Principle C in (56c).

(56) a. α *o-commands* β iff α locally o-commands some γ dominating β.

b. α *o-binds* β iff α and β are coindexed and α *o-commands* β. If β is not o-bound, then it is said to be *o-free*.

c. Principle C

A nonpronoun must be o-free.

In (55b) *John*, a nonpronoun, is (locally) o-bound by *himself*, violating (56c).

As we have seen, the contrast between (55a) and (55b) is correctly accounted for by (54) and (56c). Nonetheless, Pollard and Sag's analysis inherits the same problem that Chomsky's (1981, 1986b) binding theory has. It fails to formulate the intrinsic property of anaphors that they must be bound unless they are discourse-bound. Let us consider the ungrammatical strings in (41) and (49), repeated as (57).

(57) a. *[This picture of himself] sells well.
      b. *[Both himself and Mary] snored.

c.   *[No one but himself] criticized John.
d.   *[Himself] laughed.

In (57d) there is no NP that locally o-commands *himself*. This makes the reflexive exempt from Principle A (54). Since *himself* is the only NP, (56c) does not apply. So there is no principle that explains the ungrammaticality of (57d). Pollard and Sag attribute the ungrammaticalilty of (57d) to the morphological fact that English reflexives lack the nominative case. This account, however, is not justifiable for the following reasons. It predicts that a sentence like (57d) is grammatical if a language allows a nominative anaphor. But this prediction is incorrect, as the following example shows:

(58)   #Caki-ka   wus-ess-ta.
         self-NOM laugh-PST-DE
         'Self laughed.'

In (58) the reflexive pronoun *caki* is marked by the nominative marker -*ka*. Unless *caki* is discourse-bound, the sentence is ungrammatical. The second problem of this morphological account is that it cannot account for the ungrammaticality of (57a-c), which illustrate the same point as (57d). In (57a), for example, there is no mismatch of case, since *himself* is used as a complement of the preposition *of*. Since no NP locally o-commands it, Principle A in (54) is not applicable. Nor is Principle C in (56c) applicable. Therefore, the ungrammaticality of (57a-c) remains unexplained on Pollard and Sag's analysis.

The other alternative binding theory advocated by Reinhart and Reuland (1991) and Reuland and Reinhart (1991) has the same empirical problem. Reuland and Reinhart (1991) propose that the standard formulations of Principles A and B in (59) be

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reformulated.

(59) a. Principle A: An anaphor is bound in its governing category.

       b. Principle B: A pronominal is free in its governing category.

The reformulated binding principles are as follows:

(60) Definitions

       a. The *syntactic predicate* of (a head) P is P, all its syntactic arguments and an external argument of P (subject). The *syntactic arguments* of P are the projections assigned theta roles or Case by P.

       b. The *semantic predicate* of P is P and all its arguments at the relevant semantic level.

       c. A predicate is *reflexive* iff two of its arguments are coindexed.

       d. A predicate (of P) is *reflexive-marked* iff either P is lexically reflexive or one of P's arguments is a SELF-anaphor.

(61) a. Principle A: A reflexive-marked syntactic predicate is reflexive.

       b. Principle B: A reflexive semantic predicate is reflexive-marked.

We do not have much to say about Principle B in (61b). It correctly accounts for the complementarity between R-pronouns and bound pronouns in sentences like (62).

(62) a. No one$_i$ criticized himself$_i$.

       b. *No one$_i$ criticized him$_i$.

In (62a) the two NPs are coindexed, and thus the (semantic) predicate *No one$_i$ criticized himself$_i$* is reflexive. Since one of the predicate's arguments is filled by

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himself, sentence (62a) conforms to Principle B in (61b). In (62b) the two coindexed NPs *no one* and *him* make the (semantic) predicate *No one$_i$ criticized him$_i$* reflexive. But neither of the predicate's arguments is filled by a reflexive, hence Principle B is violated.

As Reuland and Reinhart (1991) demonstrate, Principle A in (61a) governs the bound versus the logophoric uses of SELF-anaphors. According to them, SELF-anaphors are morphologically complex anaphors like Dutch *zichzelf* and Norwegian *seg selv*. English R-pronouns are thus SELF-anaphors. The logophoric use of anaphors refers to long-distance bound anaphors involving "point of view" or discourse-bound anaphors. For detailed discussion of logophoric anaphors, see Clements 1975, Kuno 1987, Sells 1987, and Zribi-Hertz 1989. Let us now consider the following sentences:

(63)   a.   *Mary$_i$ said that John loved herself$_i$.
           b.   Mary$_i$ said that John loved no one but herself$_i$.

In (63a) the syntactic predicate *John loved herself* is reflexive-marked. Therefore it must be reflexive by virtue of (61a). Since *John* is not coindexed with *herself* and since *loved* is not lexically reflexive, the sentence violates Principle A in (61a). In (63b) no syntactic predicate is reflexive-marked. Hence Principle A does not apply, and the logophoric interpretation of *herself* is allowed, as desired.

Although (61a) deals adequately with the contrast between (63a) and (63b), it encounters some problems in handling the ungrammaticality of the strings in (57). First, it is not clear whether (57d) violates (61a). Clearly, the syntactic predicate *himself laughed* is reflexive-marked. This predicate, however, has only one argument, the subject. The definition of reflexive in (60c) seems to presuppose that it apply to

only the predicates that have more than one argument. In order to rule out (57d), (60c) must be restated as follows:

(64)   A predicate is *reflexive* iff it contains two coindexed arguments.

The predicate *himself laughed* in (57d) then does not meet this revised definition. Hence (61a) is violated. In each string in (57a-c), the reflexive *himself* is not an argument of a syntactic predicate. Since (61a) is not applicable, it is predicted that the logophoric interpretation may be possible. The binding theory of Reuland and Reinhart (1991) correctly predicts that at least in English, reflexives may be discourse-bound in sentences like (57a-c), but not in sentences like (57d), as noted by Ross (1970), Zribi-Hertz (1989), etc. However, it is not sufficient to say that this is all the binding theory accounts for. What does it mean to say that the logophoric interpretation of reflexives is possible in (57a-c)? It certainly does not mean that the binding interpretation that is absent in (57d) is also impossible in (57a-c). In other words, their theory is not sufficient to explain the fact that the strings in (57a-c) are ungrammatical unless the reflexives contained in those strings are discourse-bound. We must account for this fact anyhow, since strings like them are never possible out of context.

Nothing has been so far said about the asymmetry of the AA relation. Consider the contrast shown in (55), repeated as (65).

(65)   a.   John$_i$ criticized himself$_i$.
        b.   *Himself$_i$ criticized John$_i$.

In order to explain the asymmetry of the AA relation, Reuland and Reinhart (1991)

propose the general definition of chain in (66) and its condition in (67).

(66) Generalized Chain Definition

$C = (\alpha_1, ..., \alpha_n)$ is a chain iff C is the maximal sequence such that

i.   there is an index i such that for all j, $1 \leq j \leq n$, α_j carries that index, and

ii.   for all j, $1 \leq j \leq n$, α_j governs α_{j+1}.

(67) Condition on A-Chains

An A(rgument)-chain is headed by a unique referentially independent NP.

(66) says that a chain consists of coindexed elements that may be phonologically overt or null. An A-chain is one whose head is in an A-position. Reuland and Reinhart stipulate that pronominals including pro and PRO, R-expressions, and wh-traces are referentially independent. In (65a) the A-chain ($John_i, himself_i$) is formed. Since the head *John* is referentially independent, the chain satisfies (67). The A-chain ($himself_i$, $John_i$) formed in (65b), however, fails to meet (67), since *himself* is not referentially independent.

One might argue that the ungrammaticality of the strings in (57a-c) can be adequately dealt with by means of the chain condition in (67). In each of the strings, the reflexive pronoun *himself* forms a singleton chain. Suppose discourse-bound anaphors are treated as referentially independent. Then the logophoric interpretation of *himself* in these strings can be said to satisfy (67). By contrast, the usual binding interpretation requires *himself* to be referentially dependent. Therefore, on the binding reading of (57a-c), the singleton chain formed by *himself* fails to satisfy (67). It seems that the account suggested here explains the fact that the strings in (57a-c) are ungrammatical unless the reflexive pronouns contained by these strings are discourse-bound. Nevertheless, there is no way to accommodate such an account in Reuland and

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Reinhart's theory. In order to do so, the strings in question must be subject to Principle A in (61a), which is never possible.

Thus far we have discussed how difficult it is to explain the fact that the strings in (57a-c) are ungrammatical unless the reflexives contained by them are discourse-bound. Chomsky 1981, 1986b, Pollard and Sag 1992, and Reuland and Reinhart 1991 all fail to explain this fact. As reformulated in (40a) and (40b), repeated as (68), the Theta Role Hierarchy Condition and Bach and Partee's F-Command Condition account for it.

(68)   a.   For each anaphor α, there must be an NP β such that (i) β is a coindexed coargument of α, and (ii) β outranks α on the Theta Role Hierarchy.

       b.   For each anaphor α, there must be an NP β such that (i) β is coindexed with α, and (ii) β f-commands α.

As far as I know, (68a) and (68b) are the only conditions that directly constrain the distribution of anaphors that formalize the intuition that anaphors must be bound unless they are discourse-bound. By contrast, the condition (8) and the NRC (9), repeated as (69) and (70), respectively, do not directly constrain the distribution of anaphors or say that anaphors need their antecedent unless they are discourse-bound.

(69)   Given that no lexical items can be assigned the type that the set of combinators assumed to operate in the syntax of a language cannot derive from the basic set of categories e and t, do not apply unary composition to the subject NP of category $t/(t\backslash e)$.

(70)   In main transitive sentences, a structurally nominative NP is interpreted by a nominative case extension of a basic function (= GQ).

Nonetheless, they seem to give a natural account of the ungrammaticality of the strings in (57). For each string, the grammar of English identifies the bracketed NP as a subject or a structurally nominative NP. (69) requires this NP to be of type $t/(t\backslash e)$. But such NPs as *himself* and *this picture of himself* are not of type $t/(t\backslash e)$. On Szabolcsi's (1989, 1992) analysis, all such NPs would be of type $(t/e)/((t\backslash e)/e)$. (70) requires that structurally nominative NPs be referentially autonomous. However, the bracketed NPs in (57) are not RA, violating (70). Both Szabolcsi 1989, 1992 and Keenan 1988b, 1989 lexically code the property of anaphors that they are bound in the sentence unless they are discourse-bound. As we saw, conditions (69) and (70) guarantee that there must be an RA NP in each English sentence. I.e., the subject NP of a sentence is always RA. Suppose a sentence S contains an anaphor R. By virtue of (69) and (70), R must not occur in the subject position or in the position contained by the subject NP. This guarantees that the subject NP of S can be a possible antecedent of R. The lexical specification of anaphors given by the grammar of English will specify in what context anaphors can, must, and must not be bound.

What the ungrammaticality of (57a) and (57b) implies is that there must be a principle that rules out the sentence in which an anaphor cannot be bound at all. Such a principle will handle not only sentences like (57), where no possible antecedent of an anaphor is present, but also sentences like (65b), which violates the Anaphora Asymmetry Universal. Whether an anaphor is bound in a certain local domain is a purely lexical matter. As we showed, the PRA is exactly like (69) and (70) for the purposes mentioned above. In (57) all of the bracketed NPs are not RA unless the reflexives are discourse-bound. Therefore, the PRA correctly predicts that they are all ungrammatical unless the reflexives are discourse-bound. The PRA, however, differs from (69) and (70) in that no mention of "subject" or "structurally nominative" is made.

As we emphasized in the preceding section, such notions are difficult to apply uniformly to languages like Batak and Samoan. Nevertheless, our analysis makes an accurate prediction that the strings corresponding to (57) in Batak or Samoan are all ungrammatical unless the reflexives contained by those strings are discourse-bound.

3.2.3. Predication and the PRA

In the previous two sections 3.2.1 and 3.2.2, we argued that the PRA is conceptually and empirically superior to any of the existing constraints that govern the distribution of anaphors directly or indirectly. As we have seen, the PRA differs from the other constraints in another crucial respect. Unlike the latter, the PRA does not require that anaphors be anteceded by what we might call "subject" in the binary nuclear sentences. In this section we further argue for our approach but also give an answer to why so many languages allow anaphors to be anteceded by the "subject" in the binary nuclear sentences.

Before we answer the question raised above, we should recall how referentially dependent items (RDIs) like English R-pronouns are interpreted. Consider the following examples:

(71)　a.　Mary$_i$ criticized herself$_i$.
　　　 b.　*Herself$_i$ criticized Mary$_i$.
　　　 c.　SELF = $\lambda R \lambda x[x\ R\ x]$ for $x \in E$ (the set of objects), $R \subseteq E \times E$
　　　 d.　$I_m(SELF(CRITICIZE))$ = $I_m(\lambda x[x\ CRITICIZE\ x])$
　　　　　　　　　　　　　　　 = $\lambda x[x\ CRITICIZE\ x](m) = m\ CRITICIZE\ m$

As we mentioned before, reflexives are interpreted as the SELF function in (71c) that

sends a binary relation R to a property $\lambda x[x \ R \ x]$. So SELF takes CRITICIZE, the denotation of *criticized* to a property $\lambda x[x \ \text{CRITICIZE} \ x]$. Then, $\mathbf{I_m}$, the principal filter generated by the property of being m, applies to this property, as in (71d). If (71b) were grammatical, it would be interpreted in the same way that (71a) is interpreted.

What is crucial to our discussion is the notion of "target" of predication. Let S be a binary nuclear sentence of the form:

(72) $[_S \ \text{NP}_1 \ V \ \text{NP}_2]$ (order irrelevant)

Then we say that for $x = 1$ or 2, NP_x is a target of predication in S iff the denotation of NP_x applies to the property denoted by the rest of S. The way we interpret the strings in (71a) and (71b) suggests that the antecedent of an RDI must be a target of predication in the binary nuclear sentence it occurs in. It is utterly implausible to say that the RDI occurring in the binary nuclear sentence denotes something that may apply to the property denoted by its antecedent and the transitive verb. Note that RDIs never occur in unary nuclear sentences unless they are used deictically. In interpreting binary nuclear sentences like (71a) and (71b), we must first combine an RDI with a transitive verb.

By contrast, in interpreting the binary nuclear sentence that contains no RDI, either of the independent NP occurrences can, in principle, be a target of predication in that sentence. As illustration, let us consider how we interpret (73a).

(73)   a.   Mary criticized John.
         b. $\text{MARY}_{nom}(\text{JOHN}_{acc}(\text{CRITICIZE})) = \mathbf{I_m}(\lambda x[x \ \text{CRITICIZE} \ j])$

c. $JOHN_{acc}(MARY_{nom}(CRITICIZE)) = I_j(\lambda x[m \text{ CRITICIZE } x])$

d. $I_m(\lambda x[x \text{ CRITICIZE } j]) = \lambda x[x \text{ CRITICIZE } j](m) = m \text{ CRITICIZE } j$
   $= \lambda x[m \text{ CRITICIZE } x](j) = I_j(\lambda x[m \text{ CRITICIZE } x])$

Whether we interpret the sentence as in (73b) or in (73c), we have the same truth condition, as the lambda-conversion in (73d) shows. In (73b) *Mary* is the target of predication, but in (73c) *John* is. Although it does not matter from the semantic point of view whether we interpret (73a) as in (73b) or as in (73c), only (73b) is compatible with the observed syntactic fact regarding English sentences. In the previous chapter we assumed that a transitive verb forms a constituent with its object NP to the exclusion of its subject NP in a binary nuclear sentence like (73a). Since no syntactic operations are available that allow the transitive verb to form a constituent with its subject NP to the exclusion of its object NP, we are naturally led to conclude that only the occurrence of a subject NP can be a target of predication in a binary nuclear sentence like (73a).

The conclusion that (73b) but not (73c) is a legitimate way of interpreting (73a) suggests a functional explanation of why the antecedent of an RDI, required to be a target of predication, must be a subject in a binary nuclear sentence. We suspect that there is a correlation between the structure of predication and the pattern of anaphoric dependencies. We attribute the fact that English chooses, say (71a) rather than (71b) to code the AA relation in a binary nuclear sentence to the Maximal Uniformity Condition on Predication (MUCP) in (74).

(74)   The Maximal Uniformity Condition on Predication

In every language the structure of predication should be maximally uniform, unless marked otherwise.

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Since (71a) has the predication structure parallel to (73b), it satisfies the MUCP (74). However, (71b) must have a different predication structure if it were grammatical, and thus it violates (74). This is why (71a) rather than (71b) is chosen as a grammatical form of anaphoric dependencies.

In many of the languages where grammatical functions like "subject" and "object" are useful tools for describing linguistic phenomena, what we might call "subject" rather than "object" serves as the optimal target of predication in a binary nuclear sentence. This is a general tendency that holds not only for subject-oriented languages like Indo-European languages but also for topic-oriented languages like Japanese and Korean. Consider the following Korean sentence:

(75)   a.   Mary-ka   John-ul   pinanhay-ss-ta.
             -NOM   -ACC   criticize-PST-DE
           'Mary criticized John.'

       b. $MARY_{nom}(JOHN_{acc}(CRITICIZE)) = \mathbf{I_m}(\lambda x[x \text{ CRITICIZE } j])$
       c. $JOHN_{acc}(MARY_{nom}(CRITICIZE)) = \mathbf{I_j}(\lambda x[m \text{ CRITICIZE } x])$

In sentence (75a), which corresponds to (73a), the subject NP is nominative marked by -ka and the object NP is accusative marked by -ul. Again, truth conditionally speaking, it does not matter whether we interpret (75a) as in (75b) or as in (75c). Despite the absence of decisive evidence, our **Little Korean** in Ch. 2 assumes that the transitive verb forms a constituent with either of the NPs to the exclusion of the other. An appropriate analysis would show that (75b) is a correct predication form for (75a). Hence, the ka-marked NP Mary-ka serves as a target of predication in (75a). The MUCP then forces the antecedent of an anaphor to be nominative marked rather than to be accusative marked in a binary nuclear sentence, as shown in (76).

(76) a. Mary$_i$-ka caki$_i$-lul pinanhay-ss-ta.
           -NOM   -ACC   criticize-PST-DE
       'Mary criticized herself.'

      b. *Caki$_i$-ka Mary$_i$-lul pinanhay-ss-ta.
           -NOM   -ACC   criticize-PST-DE
       'Herself criticized Mary.'

To summarize, in many languages where the notions of subject and object are well-understood, subject is a prime target of predication in binary nuclear sentences containing no RDI, and the MUCP requires that subject be a target of predication also in the binary nuclear sentences that contain an RDI but are structurally similar to the binary nuclear sentences where no RDI occurs and subject is a target of predication. The MUCP, however, does not require that in such languages, subject must be a target of predication in all binary nuclear sentences. Our analysis does not exclude the possibility that sentences with different structures may have different forms of predication. The following Korean sentences exemplify this possibility:

(77) a. Mary-nun John-ul pinanhay-ss-ta.
           -TOP   -ACC   criticize-PST-DE
       'As for Mary, she criticized John.'

      b. John-un Mary-ka pinanhay-ss-ta.
           -TOP   -NOM   criticize-PST-DE
       'As for John, Mary criticized him.'

Given sentences like (77), it is not immediately apparent which NP is subject and which NP is object. In (77a) the topic marked NP *Mary-nun* is understood to bear the same theta role as the nominative marked NP *Mary-ka* in (75a). In (77b) the topic

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marked NP *John-un* is understood to bear the same theta role as the accusative marked NP *John-ul* in (75a). In a binary nuclear sentence a topic marked NP can be interpreted nominatively as in (77a) or accusatively as in (77b). Empirical work on Korean Topic Constructions suggests that the denotation of a topic marked NP is necessarily what the sentence in which it occurs is about.[8] One of the ways of implementing this idiosyncrasy is making a topic marked NP be a target of predication. On this view, the predication structures shown in (78a) and (78b) would be assigned to (77a) and (77b), respectively.

(78)   a. $I_m(JOHN_{acc}(CRITICIZE)) = I_m(\lambda x[x\ CRITICIZE\ j])$

        b. $I_j(MARY_{nom}(CRITICIZE)) = I_j(\lambda x[m\ CRITICIZE\ x])$

In the Topic Constructions in question, case marked NPs are interpreted as "lifted" GQs that take binary relations to properties, conforming to the case extensions conditions, the NEC and the AEC. For more detail, see Ch. 2. By contrast, topic marked NPs always denote generalized quantifiers (GQs) and serve as targets of predication.

Given that a topic marked NP is always a target of predication, the MUCP predicts that either of the case marked NPs can be replaced by an RDI, but the topic marked NP must be RA. This prediction is borne out by the following sentences:

(79)   a.   John-hako Mary-nun   selo-lul   pinanhay-ss-ta.

               -and   -TOP   each other-ACC criticize-PST-DE

           'As for John and Mary, they criticized each other.'

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[8]For detailed discussion of Korean Topic Constructions, see Lee 1991 and references cited there.

b. John-hako Mary-nun caki-lul pinanhay-ss-ta.
   -and   -TOP   self-ACC criticize-PST-DE
   'As for John and Mary, they criticized themselves.'

(80) a. John-hako Mary-nun selo-ka   pinanhay-ss-ta.
      -and   -TOP   each other-NOM criticize-PST-DE
      'As for John and Mary, each other criticized them.'

   b. John-hako Mary-nun caki-ka   pinanhay-ss-ta.
      -and   -TOP   self-NOM criticize-PST-DE
      'As for John and Mary, themselves criticized them.'

(79a) contains the accusative marked reciprocal *selo-lul*, and (79b), the accusative marked reflexive *caki-lul*. In (80), however, it is the nominative marked NPs that are referentially dependent. (79a) and (79b) are normal, unmarked ways of expressing reciprocality and reflexivity, respectively. These sentences are not only grammatical but also natural. (80a) and (80b) are alternative ways of expressing reciprocality and reflexivity, respectively. Although the sentences in (79) and their corresponding sentences in (80) have the same truth conditional meaning, there is a pragmatic difference between those sentences. The sentences in (80) convey some "contrastiveness" that is absent in the sentences in (79). We may paraphrase (80a) and (80b) as below:

(81) a. ˙ As for John and Mary, it is John that criticized Mary and it is Mary that criticized John.

   b. As for John and Mary, it is they themselves that criticized John and Mary.

Note also that some people find (80b) marginal. However, even such people do not hesitate in accepting the grammaticality of (80a). We suspect that they perceive that

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(80a) expresses contrastiveness more easily than (80b). They are also willing to accept sentences like (82), where contrastiveness is explicitly marked.

(82)   John-hako Mary-nun talun   salam-i   anin caki-ka   pinanhay-ss-ta.
        -and   -TOP different person-NOM not self-NOM criticize-PST-DE
        'As for John and Mary, they themselves but not others criticized them.'

Akira Nakamura (personal communication) points out to me that Japanese shows the same binding properties in the Topic Constructions as we observed above:

(83)   a.   John-to Mary-wa   otagai-o   aisite-te-iru.
              -and   -TOP   each other-ACC   love-PROG-PRES
              'As for John and Mary, they love each other.'

        b.   John-to Mary-wa   zibun-o   aisite-te-iru.
              -and   -TOP   self-ACC   love-PROG-PRES
              'As for John and Mary, they love themselves.'

(84)   a.   John-to Mary-wa   otagai-ga   aisite-te-iru.
              -and   -TOP   each other-NOM   love-PROG-PRES
              'As for John and Mary, each other love them.'

        b.   John-to Mary-wa   zibun-ga   aisite-te-iru.
              -and   -TOP   self-NOM   love-PROG-PRES
              'As for John and Mary, themselves love them.'

The facts of Topic Constructions in Japanese and Korean and the distribution of RDIs in those constructions support the claim that there exists a correlation between the form of predication and the positioning of a possible antecedent of an RDI. Our MUCP correctly predicts that in the Topic Construction, RDIs may be accusative marked as in (79) and (83) or nominative marked as in (80) and (84). Notice that the grammaticality

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of (80) and (84) poses a problem for Chomsky's binding theory. Since the theory requires that the antecedent of an RDI be in an A-position and since topic marked NPs are assumed to occur in an A'-position, the sentences in (80) and (84) would be incorrectly predicted to be ungrammatical. The fact that (80) and (84) are grammatical is also problematic on the approaches taken by Szabolcsi (1989, 1992) and Keenan (1988b, 1989). Since these approaches prohibit RDIs from being understood as the subject or structurally nominative NP of a sentence, they correctly rule out (71b) and (76b). But they would also incorrectly rule out (80) and (84) inasmuch as the nominative marked RDIs in these sentences are treated as subject or structurally nominative NPs. By contrast, the PRA is entirely compatible with (80) and (84). It requires nothing but referential autonomy to be a qualification for possible antecedents of RDIs. Suppose the referential autonomy function for Korean RAF_{Korean} is defined as below:

(85)   For any nuclear sentence S, $RAF_{Korean}(S)$ is

   i.   the leftmost NP suffixed with *-ka/-i* if there is no NP suffixed with *-nun/-un* in S, or

   ii.   the NP suffixed with *-nun/-un* if it is leftmost in S.

According to (85ii), RAF_{Korean} identifies the topic marked NPs in (79) and (80) as referentially autonomous. However, it does not constrain how RDIs are case marked or distributed, as desired.

Many languages where the notions of subject and object are well-understood exhibit a very general tendency that subject is a prime target of predication. We observed in those languages that the antecedents of RDIs occur generally in the subject

position. We explained the latter observation in terms of the MUCP which requires that *the predication structure of a language be maximally uniform, unless marked otherwise.* This explains why anaphors are anteceded in many languages by what we might call "subject" in binary nuclear sentences.

3.3. A Unified Account of Crossover

3.3.1. Introduction

In the preceding two sections 3.1 and 3.2, we argued that the way we explain the AAU in terms of the PRA plus certain language-specific facts is conceptually and empirically preferred to other existing theories of anaphora. In this section, extending further the approach that constrains the presence of possible antecedents of RDIs rather than the distribution of RDIs themselves, we provide a unified account of strong and weak crossover.

In section 3.3.2 below, as a first step towards a uniform characterization of crossover, we review some of the previous approaches that regard crossover as a restriction on the dependency of RDIs upon quantificational phrases like wh-phrases or quantified NPs. In section 3.3.3 we discuss a number of examples problematic for those approaches to crossover and argue that the effects of crossover must be ascribed to a principle which is motivated independently of a necessary condition on bound anaphora. In section 3.3.4 we first characterize crossover as another manifestation of the AAU. We then show how the PRA accounts uniformly for core examples of strong and weak crossover in terms of the notion of (syntactically complex) referentially

dependent NPs. As we will see, the proposed account is simpler and more descriptively adequate than current theories of crossover.

3.3.2. Previous Approaches to Crossover

Since earlier periods of transformational grammar, it has been observed that there is a restriction on the referential dependency between certain lexical items such as pronouns or R-pronouns and nonreferential expressions such as wh-phrases or quantified NPs.[9] The following set of examples illustrates what such a restriction would be:

(86) a. Everyone$_i$ loves himself$_i$.

     b. Nobody$_i$ married the man who she$_i$ hated.

(87) a. *His$_i$ mother claimed that nobody$_i$ won the game.

     b. *His$_i$ friend wondered who$_i$ came to the party.

(88) a. *He$_i$/Himself$_i$ loves everyone$_i$.

     b. *Who$_i$ did he$_i$ say that Mary loved?

(89) a. *His$_i$ mother loves everyone$_i$.

     b. *Who$_i$ did his$_i$ mother say that Mary loved?

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[9]As far as I can tell, it was Ross (1967) that first addressed this issue from the point of view of generative linguistics. In order to rule out sentences like (ia), he proposed the condition in (ib).

(i) a. *The pudding$_i$ which the man who ordered it$_i$ said would be tasty was a horror show.

     b. No NP mentioned in the structure index of a transformation may be ordered by that rule in such a way as to cross over a coreferential NP.

Even though Ross did not distinguish between strong and weak crossover, he may be the first linguist who discussed weak crossover sentences like (ia). For other transformational approaches, see Postal 1971 and Lakoff 1976, among others.

In (86a) the reflexive pronoun *himself* is bound to the subject NP *everyone*. In (86b) the subject NP of the relative clause *she* is bound to the subject NP of the matrix clause *nobody*. It is uncontroversial to treat pronouns as bound variables when they are bound by wh-phrases or quantified NPs. Unlike the sentences in (86), the ones in (87)-(89) do not allow an RDI such as *his* or *himself* to be construed as a variable bound by a wh-phrase or quantified NP.

It has often been suggested that the unavailability of the bound variable construal of RDIs in these sentences is due to different mechanisms. There is a clear difference between the sentences in (87) and the sentences in (88) and (89). Empirical work shows that in examples like (87) the scope of a wh-phrase or quantified NP is restricted to the clause in which it occurs. In (87a) the quantified NP *nobody* has scope over the embedded clause, and in (87b) the scope of the wh-phrase *who* is limited to the complement clause due to the subcategorization feature of *wonder*. In both examples the pronoun *his* lies outside of the scope of its intended antecedent. By contrast, in the sentences of (88) and (89), all of the RDIs occur within the scope of their intended antecedent, the matrix clause. Nonetheless, no bound variable construal is available in those sentences. This is why such examples as (88) and (89) have fascinated so many researchers in various generative frameworks. As Wasow (1972) notes, there is also a difference between the sentences in (88) and the ones in (89). The former illustrate strong crossover (SCO) and the latter, weak crossover (WCO). They are so called by Wasow because the judgment involved in the SCO examples is stronger than the judgment involved in the WCO examples.

Various accounts have been proposed to explain the above paradigm. The contrast between (86) and (87) has led virtually all linguists and philosophical logicians to agree that RDIs must be in the scope of their quantified antecedents. But they

disagree as to how to determine and represent scope. There are two competing views on this matter. One view holds that the surface structure of natural languages is not adequate to represent scope and that scope is syntactically represented at a (disambiguating) level of representation called Logical Form (LF). Chomsky 1976, 1982, May 1977, 1985, Aoun, Hornstein, and Sportiche 1980, Higginbotham and May 1980, and Huang 1982 are representative of this view. Given the standard definition of scope in (90a),[10] something like (90b) has been proposed as the necessary condition for the bound variable construal of pronouns.

(90)   a.   The scope of α is the set of nodes that α c-commands at LF.

       b.   A pronoun P is construed as a variable bound by a quantifier Q raised by May's (1977) Quantifier-Raising (QR) only if P is in the scope of Q.

This LF condition would correctly predict the absence of a bound variable construal in (87), given that independent constraints block the quantificational phrases in (87) from taking scope over the matrix clause where the pronoun occurs.

On the other hand, the alternative view maintains that scope is determined solely by the properties of surface structure. Reinhart (1983a, b) and Haïk (1984) argue that quantified NPs can have scope over the elements in their c-command domain at the surface structure enriched with wh-traces, even though the latter allows NPs occurring in the same minimal sentence to freely take scope over each other. Bach and Partee (1980) and Partee and Bach (1981) treat wide scope quantification in terms of Cooper's (1975) Storage mechanism, which makes LF unnecessary. Keenan (1988b, 1989) and

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[10]For an alternative definition of scope in terms of 'm-command' and its consequences, see May 1985. We will discuss some aspects of May's theory in section 3.3.3.

Ben-Shalom (in progress) also show that surface structure is sufficient to represent scope ambiguity in binary nuclear sentences by extending the NP denotations. All of these theories, however, would preclude the quantificational phrases in (87) from taking scope over the matrix clause where the pronoun occurs and thus rule out the bound variable construal of the pronouns.

It is worthy of note that whether scope is defined as a property of LF or surface structure, the surface position of a quantificational phrase is not an *absolute* factor; all the theories would allow the quantificational phrases in (88) and (89) to have scope over their matrix sentences. This means that to explain the impossibility of bound anaphora in those sentences, we must put some qualification on our initial necessary condition that an RDI must be in the scope of its antecedent or provide an additional constraint. Different ways of determining scope suggest different ways of constraining bound anaphora.

Reinhart (1983a, b) proposes that the necessary condition be qualified as follows:

(91)   Quantified NPs and wh-traces can have anaphoric relations only with pronouns in their c-command syntactic domain at S-Structure.

Condition (91) then uniformly accounts for the SCO examples in (88) and the WCO ones in (89). At the S-Structure of those examples, the RDIs are not c-commanded by a quantified NP or a wh-trace. (91) also accounts for the ungrammaticality of (87) regardless of the clause-boundness of scope. Although (91) gives a descriptively correct account for the paradigm, it raises the question of why quantified NPs and wh-traces belong to the same category for the purposes of bound anaphora. In addition,

there have been some counterexamples to (91) raised in the literature. We will return to them later.

Turning to the LF approaches, we observe that the necessary condition (90b) itself cannot explain the fact that no bound variable interpretation of RDIs is possible in the crossover examples in (88) and (89). This is so because these RDIs would be within the scope of their quantificational antecedents in the LF representations of those examples. The first serious attempt in the LF theory to explain crossover is provided by Chomsky 1976, which implicitly assumes the following:

(92)   A pronoun may not be directly bound by a quantifier (at LF).

As Lasnik and Stowell (1991) point out, it follows from (92) that to be interpreted as a variable, a pronoun must be anaphoric to the trace which in turn must be bound at LF by an operator phrase such as a wh-moved NP or a quantified NP or wh-in-situ raised by QR. In the LF theory, then, the two types of crossover are characterized in terms of the different LF configurations formed by RDIs and their intended antecedents. In the LF representation of (88) an RDI c-commands the trace of a quantificational phrase, but in the LF representation of (89) neither of them c-commands the other.

One standard account of SCO within the GB framework attributes the ungrammaticality of (88) to a violation of Principle C of the binding theory:[11]

(93)   Principle C of the Binding Theory (Chomsky 1986b)

An R-expression is free (in the domain of the head of its chain).

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[11]A treatment of SCO along this line originates in Chomsky 1976.

This means that an R-expression must either be free or have as a local binder an element in an A'-position. On this account, (88a) is mapped to the LF representation in (94) by the QR of *everyone*.

(94) $[_{IP}$ everyone$_i$ $[_{IP}$ he$_i$/himself$_i$ loves t$_i$]]

Under the assumption that wh-traces and traces left behind by QR are R-expressions, the trace t$_i$ must be A(rgument)-free in (94). However, t$_i$ is bound by the subject NP *he/himself*, violating Principle C. Likewise, the bound variable construal of the pronoun *he* is excluded in (88b), since the wh-trace is A-bound by the matrix subject NP *he*.[12]

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[12]An alternative account of SCO is proposed by Chomsky (1982) and Sportiche (1985). This account appeals to Chomsky's (1981) definition of variables in (i).

(i) a. α is a variable iff α is locally A'-bound and in an A-position.

b. α is locally bound by β iff α is X-bound by β, and if there is γ such that γ Y-binds α and γ is bound by β, then $\gamma = \beta$.

The LF-trace of *everyone* in (88a) and the wh-trace in (88b) both fail to satisfy the definition of variables given in (ia) since they are not locally A'-bound. Thus these empty categories should satisfy the well-formed definitions for the other types of empty category. They cannot be pronominal anaphor PROs since they occur in governed A-positions. They cannot be anaphoric NP-traces since they are bound by an element with an independent θ-role. They cannot be pros since English does not have agreement features to license them. Since they do not belong to any well-formed type of empty category, the SCO configurations in (94) should be ruled out. Thus, in order for the sentences in (88) to be well-formed, the pronouns must be interpreted as not being bound by quantified NPs or wh-phrases.

However, this account of SCO seems to have a theory-internal problem. As far as I know, no complete set of formal, well-formed definitions has been given for the types of empty category considered above. Chomsky (1982) gives the following definitions:

(ii) a. An empty category is [+anaphor] if (and only if) it is locally A-bound.

In distinction to SCO examples, WCO examples like (89) give rise to LF representations in which Principle C cannot prohibit a pronoun from being anaphoric to the trace bound at LF by a wh-moved NP or a quantified NP or wh-in-situ raised by QR. Let us consider (95a) and (95b), which are the LF representations of (89a) and (89b), respectively.

(95) a. [$_{IP}$ everyone$_i$ [$_{IP}$ his$_i$ mother loves t$_i$]]
      b. [$_{CP}$ who$_i$ did [$_{IP}$ his$_i$ mother say [$_{CP}$ that Mary loved t$_i$]]]

In both (95a) and (95b), the pronoun *his* and the trace fail to c-command each other. Hence Principle C cannot be applied. Nonetheless, no bound variable interpretation of *his* is available in (89a) and (89b). To cope with this problem, Chomsky (1976) proposes the Leftness Condition in (96).

(96) A variable cannot be the antecedent of a pronoun to its left.

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b. An empty category is [-anaphor] if (and only if) it is locally A'-bound.

c. An empty category is [+pronominal] if (and only if) it is free or locally bound by an element in a theta-position.

d. An empty category is [-pronominal] if (and only if) it is locally bound by an element in a non-theta-position.

Following the standard practice, let the above definitions be given in the biconditional form. Then no empty category can be pro, [-anaphor, +pronominal]. If an empty category is free, then it is not locally A'-bound. If an empty category is locally bound by an element in a theta-position, it is not locally A'-bound. This is because theta-positions are disjoint from A'-positions. Therefore, an empty category labeled as pro cannot exist in the first place, if the definitions are given in the biconditional form. Suppose they are given in the conditional form. Then, an empty category labeled as pro may exist. But there is no way to characterize properties of this empty category, since the two conflicting definitions of [-anaphor] and [+pronominal] say nothing at all. Note that the conditional interpretation should be abandoned. Under this interpretation, it is equally possible to have, e.g., an empty category [+anaphor, -anaphor].

The Leftness Condition then blocks the pronoun *his* from being anaphoric to the trace to its right in the LF representations in (95).

Reinhart (1983a) and Haïk (1984) argue that c-command but not precedence is relevant to the bound anaphora problem. Reinhart (1983a) provides the following sets of examples as evidence for her claim:[13]

(97) a. *People from [each of the small western cities]$_i$ hate it$_i$.
     b. *Gossip about [every businessman]$_i$ harmed his$_i$ career.
     c. *The neighbours of [each of the pianists]$_i$ hate him$_i$.

(98) a. *In everyone$_i$'s office, he$_i$ is an absolute dictator.
     b. *According to every candidate$_i$, he$_i$ is a real democrat.

In the LF representations of the above examples, the traces of the quantified NPs are coindexed with the pronouns to their right, satisfying (96). However, they are all ungrammatical according to Reinhart. Safir (1984) also presents the examples in favor of a c-command-based analysis of WCO:

(99) a. *Who$_i$ did you give [a picture of t$_i$] to him$_i$?
     b. *Who$_i$ did you convince [friends of t$_i$] to talk to him$_i$?

The examples in (99) are also problematic for the Leftness Condition (96) since it would incorrectly predict the presence of a bound variable construal in them.

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[13]In Reinhart 1983a, many other examples of different types are discussed. Some of them are as controversial as (97). May (1985) claims that all of the examples in (97) admit of bound variable anaphora easily. For more discussion, see also Lasnik and Stowell 1991 and Stowell, to appear. We will return to such controversial examples below.

Based on examples like the ones considered, it has been proposed in the main stream of the LF theory of crossover that the following is a true descriptive generalization for WCO:

(100) In a configuration where a pronoun P and a trace T are both A'-bound by a category C, T must c-command P.

Consider (95) again, repeated as (101).

(101) a. [$_{IP}$ everyone$_i$ [$_{IP}$ his$_i$ mother loves t$_i$]]
      b. [$_{CP}$ who$_i$ did [$_{IP}$ his$_i$ mother say [$_{CP}$ that Mary loved t$_i$]]]

In (101a) the LF trace t$_i$ of *everyone* fails to c-command the pronoun. In (101b) the wh-trace t$_i$ also fails to c-command the pronoun *his*. Both representations thus violate (100). Hence, sentences (89a) and (89b) do not allow for the bound variable construal of *his*.

Considerable efforts to derive (100) from primitives of grammar have been made within the GB framework. Koopman and Sportiche (1983) propose that the effect of (100) is due to the so-called Bijection Principle in (102).

(102) Bijection Principle

Each operator must A'-bind exactly one variable, and each variable must be A'-bound by exactly one operator.

Koopman and Sportiche assume Chomsky's (1981) definition of a variable in (103).

(103) α is a variable iff α is locally A'-bound and in an A-position.

By virtue of (103), the pronoun *his* and the trace t_i in (101a) count as variables bound by the operator *everyone*. Since the binding relation shown in (101a) is not one-to-one, (101a) is ruled out by the Bijection Principle. Similarly, in (101b) the wh-operator A'-binds both the pronoun inside the subject NP and its trace t_i. Since this violates the Bijection Principle, the sentence with the bound variable construal of *his* is predicted to be ungrammatical.[14]

Thus far we have discussed how SCO and WCO are handled in the general theory of LF. We have shown that the generalization (100) provides a basis for LF accounts of WCO. Before closing this section, we will point out one peculiarity of such LF accounts. It seems that (100) is a generalization that holds for not only WCO but also SCO examples. The Bijection Principle and the PCOP both fail to fully derive (100) since they are designed to deal with only WCO. Therefore, in the LF approaches, SCO must be attributed to a different mechanism, such as Principle C. This amounts to saying that working together, Principle C and the Bijection Principle derive the effects of (100). Practically speaking, (100) is exactly the same as Reinhart's

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[14]Safir (1984) proposes an alternative way of deriving (100). He formulates the Parallelism Constraint on Operator Binding (PCOP) as in (i).

(i)   If O is an operator and x is a variable bound by O, then for any y, y a variable bound by O, x and y are [αlexical].

Though the PCOP and the Bijection Principle make empirically different predictions regarding Parasitic Gap Constructions and the Across-the-Board Constructions, it is controversial whether these constructions are real counterexamples to the Bijection Principle, as pointed out by Lasnik and Stowell (1991). Note, however, that the arguments against the LF approaches to crossover that we will give in the next section will equally apply to both constraints.

(1983a) necessary condition (91) to the extent that both deal adequately with the bound anaphora problems raised by (88), (89), and (97)-(99). Thus, whether one single constraint, such as (91), or two constraints, such as Principle C and the Bijection Principle, are needed to explain crossover turns out to be an empirical question. In the next section we will take up this issue.

3.3.3. Crossover and Bound Anaphora

In the previous section 3.3.2 we showed that both the Reinhartish surface-based account and an LF-based account explain the paradigm in (86)-(89) correctly. The former appeals to a single condition (91), but the latter employs three different mechanisms, the necessary condition on bound variable anaphora (90b), Principle C (107), and the Bijection Principle (102). In this section we first point out several difficulties that LF approaches may encounter. Following Reinhart (1983a, b), we then argue that (91) is not general enough either to account for what we may call crossover phenomena. Discussion of some empirical problems with (91) leads us to conclude that none of the theories are satisfactory for the explanation of the distribution of RDIs such as bound pronouns. Although no adequate condition on bound anaphora has ever been successfully formulated, we argue, in section 3.3.4, that we can infer the ungrammaticality of crossover examples. This requires us to characterize crossover as a restriction on the binding relation between RDIs and possible antecedents of any sort, a restriction that follows from the AAU.

The LF approaches mentioned before assume that the availability of the bound variable construal of RDIs is determined at LF. However, some English constructions suggest that this is not the case. Let us consider the following sentences:

(104) a. John interviewed every student$_i$ or his$_i$ mother.
          'For every student x, John interviewed x or x's mother.'

       b. Which topic did which linguist$_i$ deal with in his$_i$ paper.
          'For which topic x, for which linguist y, x dealt with y in y's paper.'

As the translation of (104a) shows, the pronoun *his* is construed as a variable bound by *every student*.[15] Clearly, it is not an E-type pronoun in the sense of Evans 1980, since the sentence does not mean that John interviewed every student or the mother of the student that John interviewed. The availability of the bound variable construal of *his* in (104a) poses a problem for the approaches that treat bound variable anaphora as LF phenomena. By virtue of Ross's (1967) Coordinate Structure Condition (CSC), no LF representation can be derived in which *every student* is extracted to an A'-position from the coordinate NP structure. Despite the absence of such an LF representation, we get the bound variable construal of the pronoun in (104a). This fact suggests that the availability of bound variable anaphora is not a property of LF, but determined in some other component of grammar. In (104b) the pronoun *his* may be interpreted as a variable, as indicated by coindexing. This fact also poses the same problem for LF-based accounts. It is fairly widely accepted in the GB literature that the wh-in-situ in the subject position is not raised at the LF representation of (104b) but D-linked to the abstract Q-morpheme, in the sense of Pesetsky 1987. If *which linguist* is raised at LF, the sentence would be incorrectly ruled out just as a sentence like (105), which contains non-D-linked wh-phrases, is ruled out.

(105) *Whom did who love?

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[15]For discussion of the bound variable anaphora within coordinate NP structures, see Keenan and Faltz 1985 and Tyhurst 1990.

Again, the bound variable construal of a pronoun is possible even when it is not bound by an operator in an A'-position at LF.

The above two facts show that the LF approaches fail to predict *where a pronoun is interpreted as a bound variable in simple sentences.* The condition (91), however, correctly accounts for the availability of the bound variable construal of a pronoun in sentences like (104). Whether coordinate NPs have a symmetric or asymmetric constituent structure, the first conjunct NP c-commands any element contained in other conjunct NP, in the sense of Reinhart 1976. Hence (104a) conforms to (91). Treating whs-in-situ and quantified NPs alike can also make (91) be satisfied in (104b).

The second problem for the LF approaches is provided by the examples where a quantified NP embedded in a boolean compound gives rise to the same crossover effect. Consider the example in (106).

(106) a.   *His$_i$ supporters admired every senator$_i$ and Ross.
            'For every senator x, x's supporters admired x and Ross.'
       b.   Someone hated every senator and Ross.
            'There is someone x such that for every senator y, x hated y and Ross.'
            'For every senator y, there is someone x such that x hated y and Ross.'

In (106a) the bound variable construal of *his* is blocked. It is not clear at all how this is accounted for in the LF approaches. No plausible LF representation of (106a) to which the Bijection Principle (102) applies can be derived due to the CSC. Hence the LF approaches fail to predict *where a pronoun is not interpreted as a bound variable.* The ungrammaticality of (106a) cannot be simply attributed to what is responsible for the ungrammaticality of (87) since the quantified NP *every senator* may indirectly take

scope over the matrix clause, as shown by the ambiguity of (106b). This suggests that (106a) is also an example of WCO.[16] Note that (91) correctly predicts the unavailability of the bound variable construal in (106a) since the pronoun is not c-commanded by the quantified NP *every senator* at S-Structure.

The third and the biggest problem for the LF approaches arises when we take into consideration what kinds of expressions create crossover effects. As mentioned, crossover has been regarded as a restriction on the dependency of RDIs upon nonreferential phrases such as wh-phrases or quantified NPs. In other words, it is a restriction on the binding relation between RDIs and wh-phrases or quantified NPs. Thus the contrast between (107a) and (107b) in grammaticality has been often cited in the literature.

(107) a.   His$_i$ mother loved John$_i$.
       b.   *His$_i$ mother loved everyone$_i$.

Unlike quantified expressions like *everyone*, proper names like *John* can serve as an antecedent of a pronoun. But we claim that this comparison is an illusion. To show this, we need to introduce the distinction between binding and coreference made in Reinhart 1983a, b. Reinhart claims that English pronouns are ambiguous even when they take definite NPs like proper names and definite descriptions as antecedents. Let us consider the following singular sentences:

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[16]It also suggests that representing scope at LF via QR is not sufficient whenever a quantified NP forms a boolean compound, as in (106b). See Tyhurst 1990 for a possible solution to this problem. A direct semantic interpretation of scope, as suggested in Keenan 1988b, 1989, does not seem to face such a problem.

(108) a. John loves his mother.

b. $\mathbf{I}_j(\lambda x[x \text{ LOVE } j\text{'s MOTHER}])$

c. $\mathbf{I}_j(\lambda x[x \text{ LOVE } x\text{'S MOTHER}])$

According to Reinhart, (108a) is ambiguous between (108b) and (108c). The former illustrates the referential use of a pronoun, and the latter, the bound variable use. She justifies her claim by showing that a sentence like (109a) is ambiguous.

(109) a. John loves his mother and so does Mary.

b. John$_i$ loves his$_i$ mother and Mary$_j$ loves his$_i$ mother.

c. John$_i$ loves his$_i$ mother and Mary$_j$ loves his$_j$ mother.

(109a) is ambiguous between the strict identity reading in (109b) and the sloppy identity reading in (109c), as supported by work on VP-deletion (e.g., Partee 1970, Keenan 1971, Sag 1976, and Williams 1977). Without the distinction between (108b) and (108c), the ambiguity of (109a) would remain unexplained. The sloppy identity reading in (109c) is only possible when the pronoun, *his*, in the first conjunct clause of (109a) is interpreted as a bound variable. When it simply refers back to *John*, we have only the reading shown in (109b).

Salmon (1992) and Soames (1989) give another argument in favor of the bound variable use of a pronoun:

(110) Mary says, and believes, that John loves his mother.

They claim that on at least one anaphoric reading of (110), Mary is characterized as asserting and believing a proposition that attributes to John the reflexive property of

loving one's own mother. Again, this is only possible when the pronoun is interpreted as a bound variable.

It is now clear that there is no parallelism whatsoever between (107a) and (107b) above. While (107b) illustrates a binding relation if it were grammatical at all, (107a) shows a mere coreference relation. No binding relation is possible in (107a). If this is correct, it is obvious what we should compare the ungrammaticality of (107b) with: It should not be compared with the grammaticality of (107a) on the coreference reading, but with the ungrammaticality of (107a) on the binding reading.

There are three pieces of evidence supporting our claim that a sentence like (107a) lacks the bound reading. First, consider (111).

(111) a.   His$_i$ mother loves John$_i$, and Bill too.
       b.   John λx[John's mother loves x], and Bill λx[John's mother loves x] too
       c.   John λx[x's mother loves x], and Bill λx[x's mother loves x] too

Sentence (111a) exemplifies Bare Argument ellipsis. It gives rise to many readings: in the second conjunct, *Bill* can be understood as one who loves someone or as one who is loved by someone. We are here concerned only with the reading on which *Bill* is loved by someone. Given such a situation, (111a) means (111b), but not (111c). The translation (111c) reflects the reflexive property of the bound pronoun *his*, and the translation (111b) just tells that the pronoun *his* is (accidentally) coreferential with *John*. Thus the unavailability of the reading (111c) is indicative of the absence of a binding relation in the sentences that have the same structure as the first conjunct clause of (111a).

It might be objected that it is difficult to differentiate the Bare Argument ellipsis construction from the coordinate NP structure. If an expressions like *John and Bill too*

is treated as a coordinate NP, the unavailability of the bound variable construal of the pronoun in (111a) may be attributed to an independent mechanism, since the coordinate NP structure usually prevents its subconstituent from binding an RDI across its structure. However, a certain set of coordinate NP structures exhibits exactly the same fact that we have found in (111). Consider the following sentences:

(112) a. John$_i$ and no one else/John$_i$ and only John loves his$_i$ mother.
       b. John is the only person that loves John's mother.
       c. John is the only person that loves his own mother.

(113) a. *John$_i$ and no one else/John$_i$ and only John$_i$ love their$_i$ mother.
       b. John and Bill love their/*his mother.

(114) a. His$_i$ mother loves John$_i$ and no one else/John$_i$ and only John$_i$.
       b. John is the only person that John's mother loves.
       c. *John is the only person that is loved by his own mother.

(112a) contains a coordinate NP like *John and no one else* or *John and only John*, and it means either (112b) or (112c). If the pronoun is interpreted deictically, we have (112b). If it is interpreted as a bound variable, we have (112c). It is not entirely clear why and how expressions like *John and no one else* or *John and only John* must be treated as singular NPs, as the contrast between (113a) and (113b) shows. The important point here is that they seem to allow their subconstituents to bind the pronoun in (112a). This binding possibility, however, disappears in (114a). It means only (114b), which illustrates the deictic use of the pronoun *his*.

Although the above two arguments may still be disputable, the fact shown in the following paradigm gives a more decisive clue:

(115) a. John loves his mother more than Bill.

      b. John$_i$ loves his$_i$ mother more than Bill$_j$ loves his$_i$ mother.

      c. John$_i$ loves his$_i$ mother more than Bill$_j$ loves his$_j$ mother.

(116) a. His mother loves John more than Bill.

      b. His$_i$ mother$_k$ loves John$_i$ more than she$_k$ loves Bill$_j$.

      c. *His$_i$ mother loves John$_i$ more than Bill$_j$'s mother loves Bill$_j$.

Given that Bill is understood as one who loves someone, (115a) is ambiguous between (115b) and (115c). The former illustrates the deictic use of the pronoun *his*, and the latter, the bound variable use. Given that Bill is understood as one who someone loves, (116a) is interpreted only as (116b), which illustrates the deictic use of the pronoun *his* in (116a). That (116a) lacks the bound variable reading in (116c) assures that no pronouns are interpreted as bound variables in a sentence like (107a).

Given the fact that there is no binding relation at all in a sentence like (107a), we must decide whether the lack of a bound variable reading in (107a) is induced by the same mechanism that is supposed to trigger WCO effects in (107b). In our conception, *crossover is a restriction on the binding relation between RD NPs and possible antecedents of any sort.* The latter need not be limited to quantificational NPs, but include also referential NPs such as names, definite descriptions, etc. The new conception of crossover causes difficulties for the LF theories introduced before since they are designed to discriminate between quantificational and non-quantificational NPs.

As pointed out by Reinhart (1983a, b) herself, the newly defined conception of crossover poses a problem even for her bound anaphora condition (91), repeated as (117).

(117) Quantified NPs and wh-traces can have anaphoric relations only with pronouns in their c-command syntactic domain.

In (117) the antecedents of bound pronouns are restricted to quantified NPs and wh-phrases via wh-traces. In order to explain the fact that pronouns may be interpreted as variables even when they are c-commanded by referential NPs, one may want to restate (117) along the following line:

(118) To be construed as variables, pronouns must be in the c-command domain of definite NPs, quantified NPs, and wh-traces at surface structure.

As far as the examples discussed so far in this section are concerned, the revised condition (118) correctly predicts where pronouns may and may not be construed as variables. It is not the case, though, that (118) is problem-free. As noted by such researchers as Higginbotham (1980), May (1985), Reinhart (1987), and Stowell (to appear), there are some constructions that suggest that (118) is too strong. Among them are the following examples:

(119) a. Every man$_i$'s mother supports him$_i$.
     b. Nobody$_i$'s mother criticized him$_i$.

(120) a. Someone from every city$_i$ despises it$_i$.
     b. Some daughter of every author$_i$ hated some relatives of his$_i$ wife.

(119) illustrates possessive bound anaphora, and (120), inverse-linking anaphora. Higginbotham (1980), May (1985), and Reinhart (1987) argue that in sentences like (119), anaphora is possible for many speakers although quantified possessive NPs fail

to c-command pronouns. Bach and Partee (1980), on the other hand, hold that the pronouns in (119) are not genuine bound variables, but examples of Cooper's (1979) pronouns of laziness. According to their analysis, (119a) means that every man's mother supports her son. As Cooper (1983) points out, however, this interpretation requires that mothers who have exactly one son love their sons while (119a) seems to mean something stronger. This strongly suggests that the pronouns in (119) are true cases of bound anaphora. As for inverse-linking anaphora, it seems that judgments vary among people. Higginbotham (1980), May (1985), and Stowell (to appear) treat sentences like (120) as bound anaphora examples. Reinhart (1983a) and Williams (1986) basically do not accept inverse-linking anaphora, although they judge some inverse-linking examples like (120a) and (121) acceptable.

(121) Every daughter of every professor in [some small college town]$_i$ wishes she could leave it$_i$.

Recall that Reinhart (1983a) judges sentences like (97), repeated as (122), ungrammatical, but May (1985) finds them acceptable.

(122) a.   *People from [each of the small western cities]$_i$ hate it$_i$.
      b.   *Gossip about [every businessman]$_i$ harmed his$_i$ career.
      c.   *The neighbours of [each of the pianists]$_i$ hate him$_i$.

In addition to possessive anaphora examples and inverse-linking anaphora ones, some other examples have been discussed in the literature that suggest that (118) is an inadequate bound anaphora condition. First, Bach and Partee (1980) note that bound anaphora is possible in a sentence like (123).

(123) Every student claimed that [one of his professors]$_i$ was a genius in order to influence her$_i$.

Bach and Partee argue that (123) has a reading on which *one of his professors* takes scope over *claimed* but under *every student* and that on this reading the quantified NP may bind the pronoun *her* although the former fails to c-command the latter at S-Structure. Reinhart (1983a) counterargues that (123) is not a genuine case of bound anaphora but a case of a pronoun of laziness, citing the following example:

(124) Some student claimed that [none of his professors]$_i$ was a genius in order to upset her$_i$.

Reinhart claims that no interpretation shown by the coindexing of *none of his professors* and *her* is possible in (124) since a contextual interpretation required for pronouns of laziness is inapplicable. Although it is difficult for many speakers to get the bound variable construal of the pronoun, her judgment still seems disputable. Higginbotham (1987) points out that even a simple sentence similar to (123) and (124) allows for bound anaphora. Consider the following sentence (his (6)):

(125) We will sell no wine$_i$ before its$_i$ time.

In (125) the quantified NP *no wine* does not c-command the pronoun *it*. As with (124), no contextual interpretation is applicable. Despite these facts, the pronoun is naturally interpreted as a variable.

Discussing more examples of this type, Stowell (to appear) argues that there exists an asymmetry between arguments and adjuncts. Let us consider some of his

examples:

(126) a. Which man$_i$ did Mary dislike t$_i$ [pp even before she had met him$_i$].
     b. Who$_i$ did Sally meet t$_i$ [before he$_i$ had been introduced to her].
     c. John greeted every doctor$_i$ [pp after she$_i$ arrived at the airport].

Unlike the sentences in (89) where the pronouns are contained in the argument NPs, the sentences in (126) allow the pronouns contained in the adjunct PPs to be construed as variables. Despite such examples as (125) and (126), it is not uncontroversial that all of the sentences of this type admit of bound variable anaphora. Consider the following examples that Reinhart (1983a) provides as evidence for her bound anaphora condition (117):

(127) a. So many patients called a psychiatrist$_i$ that he$_i$ couldn't handle them all.
     b. We fired [each of the workers]$_i$ since he$_i$ was corrupt.
     c. You should give nobody$_i$ matches near his$_i$ child's crib.

(128) a. I pitied everyone$_i$, thinking about his$_i$ problems.
     b. Thinking about his$_i$ problems, I pitied everyone$_i$.

Reinhart judges that bound anaphora is impossible in (127a), (127b), and (128b), but possible in (127c) and (128a). Note that her judgment is not perfectly consistent. E.g., (127b) and (127c), which probably have the same structural property on the standard analysis of phrase structure, are judged differently.

That there is no general agreement regarding the grammaticality involved in (119)-(128) makes it extremely difficult to argue for or against a specific theory of bound anaphora. Following the advocates of LF, we just assume that possessive and

inverse-linking anaphora constructions involve true bound variable interpretations of pronouns. We also assume that (123)-(126) admit of bound anaphora. These assumptions entail that (118) is too strong to explain where pronouns may be construed as variables in English.[17] It does not mean, however, that there exists an LF theory that predicts where bound anaphora is possible in English. Below we argue instead that there exists no such theory at present.

We now briefly review May's (1985) theory, which we think provides one of the most refined LF analyses of bound anaphora. May defines two structural notions, one referred to here as 'DOMINATE' and one dubbed 'm-command' by Chomsky (1986a), as in (129).[18]

(129) a. α DOMINATES β if and only if every segment of α dominates β.

      b. α m-commands β if and only if α does not dominate β, and every maximal projection DOMINATING α DOMINATES β.

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[17]As Higginbotham (1980) acknowledges, possessive and inverse-linking anaphora are language-specific phenomena. He observes that they are not allowed in Chinese. Nor are they allowed in Japanese and Korean. Lee (1993) argues that a quantified NP contained in another NP cannot take scope over it in Korean, as evidenced by (i).

(i) Twu ai-uy emma-ka wa-ss-ta.
    two kids-GEN mother-NOM come-PST-DE
    'The mother of two kids came.'

As the translation shows, (i) means unambiguously that the unique mother who have/had two kids came. The absence of scope ambiguity within NPs may explain why possessive and inverse-linking anaphora do not exist in Korean. As expected, this language does not allow for bound anaphora in the corresponding examples of (123)-(126), either. In other words, (118) correctly constrains all possible occurrences of RDIs in Korean.

[18]May appears to assume DOMINANCE to be irreflexive. This allows for self-m-command.

On the basis of the above notions, May proposes the following bound anaphora condition:

(130)   A pronoun is a bound variable only if it is m-commanded by a coindexed quantifier phrase at LF.

May also assumes that a maximal projection XP can be freely adjoined to various syntactic positions via QR. In May's analysis, sentences (119a), (120a), and (125) would be mapped onto the LF representations in (131), (132), and (133), respectively.

(131) $[_{S'}[_S[_{NP}$ every man$_i$ $[_{NP}$ t$_i$'s mother$]]_j$ $[_S$ t$_j$ supports him$_i]]]$

(132) $[_{S'}[_S[_{NP}$ every city$_i$ $[_{NP}$ someone$_j$ $[_{NP}$ t$_j$ from t$_i]]]_k$ $[_S$ t$_k$ despises it$_i]]]$

(133) $[_{S'}[_S$ no wine$_i$ $[_S$ we will sell t$_i$ before its$_i$ time$]]]$

Given that S is not a maximal projection,[19] the first maximal projection DOMINATING *every man*, S', DOMINATES the pronoun *him* in (131). Accordingly, (130) guarantees that the latter may be construed as a variable bound by the former. In (132) *every city* m-commands the pronoun *it* since the first maximal projection DOMINATING the former, S', also DOMINATES the latter. Hence, the bound variable construal of the latter is secured in accordance with (130). By the same mechanism, in (133) *no wine* m-commands the pronoun *its*, which guarantees that it may be construed as a variable.

At first glance, it appears that May's (1985) LF theory will correctly predict where bound anaphora obtains in English. A closer examination of the mechanisms

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[19]Note that most current GB theories treat S as a maximal projection of I(nflection) or other functional category like T(ense) and Agr(eement).

that May employs, however, shows that this is not the case. Let us consider the following:

(134) *?Everyone from no city$_i$ despises it$_i$.

(135) [$_{S'}$[$_S$[$_{NP}$ no city$_i$ [$_{NP}$ everyone$_j$ [$_{NP}$ t$_j$ from t$_i$]]]$_k$ [$_S$ t$_k$ despises it$_i$]]].

Unlike (120a), it is extremely hard to get inverse-linking anaphora in (134). But nothing in May's theory blocks (134) from being mapped to the LF representation (135) in which the inversely linked quantified NP *no city* m-commands the pronoun *it*. One might think that this is not a problem specific to the mechanism of inverse-linking anaphora but a general problem for the LF approach to scope. As observed by Liu (1990) and further scrutinized by Szabolcsi and Zwarts (1992) and Ben-Shalom (in progress), monotone decreasing quantified NPs in object position do not take scope over the subject in sentences like (136).

(136) a. Every teacher criticized no student.
           *' There is no student such that every teacher criticized him.'

       b. Every student read few books.
           *'There are few books such that every student read them.'

Given the absence of scope ambiguity in (136), it is not surprising that no inverse-linking anaphora is possible in a sentence like (134). In order to avoid the problem in question, the theory of LF must be supplemented with the additional device that constrains the inversely linked wide scope quantification in (134) and the object wide scope quantification in (136). It is, however, questionable that there is a principled way of building such a device.

May's (1985) treatment of possessive and inverse-linking anaphora in terms of adjunction to NP brings about another theoretical problem. It is well-known that the subject NP forms an island for wh-movement in a language like English. Let us consider the ungrammatical examples in (137) and their possible derivations in (138).

(137) a. *Whose$_i$ did [$_{NP}$ t$_i$ mother] support him$_i$?

     b. *Which city$_i$ did [$_{NP}$ someone from t$_i$] despise it$_i$?

(138) a. [$_{CP}$ whose$_i$ [$_{C'}$ did$_j$ [$_{IP}$[$_{NP}$ t$_i$ mother] [$_{I'}$ t$_j$ [$_{VP}$ support him$_i$]]]]]

     a'. [$_{CP}$ whose$_i$ [$_{C'}$ did$_j$ [$_{IP}$[$_{NP}$ t$_{i'}$ [$_{NP}$ t$_i$ mother]] [$_{I'}$ t$_j$ [$_{VP}$ support him$_i$]]]]]

     b. [$_{CP}$ which city$_i$ [$_{C'}$ did$_j$ [$_{IP}$[$_{NP}$ someone from t$_i$] [$_{I'}$ t$_j$ [$_{VP}$ despise it$_i$]]]]]

     b'. [$_{CP}$ which city$_i$ [$_{C'}$ did$_j$ [$_{IP}$[$_{NP}$ t$_{i'}$ [$_{NP}$ someone from t$_i$]] [$_{I'}$ t$_j$ [$_{VP}$ despise it$_i$]]]]]

In order to explain the ill-formedness of (138), let us assume Chomsky's (1986a) theory of movement, summarized in (139)-(140).

(139) Definitions

     a. α DOMINATES β iff α dominates every segment of β.

     b. α is a Blocking Category for β iff α DOMINATES β and α is not L-marked.

     c. α L-marks β iff α is a lexical category that theta-governs β.

     d. α theta-governs β iff α is a zero-level category that theta-marks β, and α and β are sisters.

     e. α is a barrier for β iff (i) or (ii)

        i. α immediately DOMINATES δ, δ a Blocking Category for β

        ii. α is a Blocking Category for β, $\alpha \neq$ IP.

     f. α is n-subjacent to β iff there are fewer than n+1 barriers for α that exclude β.

g. α excludes β iff no segment of α dominates β.

(140) Subjacency

For any natural number n ≥ 1, let $\Phi = (\alpha_1, ..., \alpha_n)$ be a chain. Then, for every i, $1 \leq i \leq n$, α_i is 0- or 1-subjacent to α_{i+1}.

Suppose (137a) is derived in the manner shown in (138a). In (138a) the subject NP DOMINATES the wh-trace t_i and is not L-marked. According to (139b), the former is a Blocking Category for the latter. According to (139eii), it is a barrier for the trace. IP, which immediately DOMINATES it, inherits its barrierhood by virtue of (139ei). So two barriers, NP and IP, intervene between the trace t_i inside the subject NP and its local binder *whose*. Hence the derivation violates Subjacency (140). Suppose, however, that (137a) is derived in the manner shown in (138a'). Then the original wh-trace t_i is 0-subjacent to the intermediate trace $t_{i'}$ since the inner segment of the subject NP does not exclude the latter. The subject NP no longer counts as a Blocking category for the intermediate trace $t_{i'}$ since it fails to DOMINATE it. IP is a Blocking category for $t_{i'}$ but not a barrier for it by assumption (139eii). Hence the intermediate trace $t_{i'}$ is also 0-subjacent to the wh-moved *whose*. No Subjacency violation results in (138a'). In like manner, if (137b) is derived as in (138b), it results in a violation of Subjacency, but if (137b) is derived as in (138b'), no Subjacency violation results. Here, May's theory of LF runs into a difficulty. To avoid undesirable results such as (138a') and (138b'), the theory must block adjunction to NP arguments in the syntax, but at the same time, it must allow it at LF.

It might be possible to seek an answer to why adjunction to NP should be allowed in the way we mentioned. Nonetheless, we suspect that whatever the answer is, it will be an ad hoc condition on adjunction. May (1985) suggests that

quantificational phrases obligatorily undergo QR since they cannot stand as arguments bearing theta roles by assumption.[20] So in May's system, only names and A'-bound variables can occupy the argument positions of a predicate. It does not, however, prohibit such variables from occurring inside NPs or their binders from being raised in terms of adjunction mechanisms. One might propose that if a quantificational NP is adjoined to another NP, it must make pied piping obligatory, as implicitly assumed by May (1985). This may rule out the derivation shown in (138a'-b') and guarantee the existence of the derivation in (141), as desired.

(141) $[_{CP}[_{NP} \text{ whose}_i [_{NP} t_i \text{ mother}]]_j [_{C'}[_{IP} t_j \text{ support}_k\text{-ed } [_{VP} t_k \text{ him}_i]]]]$

But this would also incorrectly rule in the derivation in (142).

(142) $[_{CP}[_{NP} \text{ which city}_i [_{NP} \text{ someone from } t_i]]_j [_{C'}[_{IP} t_j \text{ despise}_k\text{-ed } [_{VP} t_k \text{ it}_i]]]]$

The best *ad hoc* stipulation that we can envisage is provided by Chomsky (1986a):

(143)   Adjunction is possible only to a maximal projection that is a nonargument.

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[20]As we have already seen in (104b), repeated as (i), this assumption cannot hold of D-linked wh-phrases.

(i)   Which topic did which linguist$_i$ deal with in his$_i$ paper?
         'For which topic x, for which linguist y, x dealt with y in y's paper?'

Since QR is inapplicable to D-linked wh-phrases like *which linguist*, they must be treated as referential NPs like names in May's theory. This does not seem to have independent motivations, though.

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As a derivational condition, (143) is intended to constrain only S-Structure movement. If QR is subject to (143), LF representations like (131) would never be possible. The following derivations illustrate this point:

(144) a. [CP[IP[NP every man$_i$'s mother] supports him$_i$]]   ⇓QR
      b. [CP[IP[NP every man$_i$ [NP t$_i$'s mother]] supports him$_i$]]]   ⇓QR
      c. [CP[IP[NP every man$_i$ [NP t$_i$'s mother]]$_j$ [IP t$_j$ supports him$_i$]]]

(145) a. [CP[IP[NP every man$_i$'s mother] supports him$_i$]]   ⇓QR
      b. [CP[IP[NP every man's mother]$_j$ [IP t$_j$ supports him$_i$]]]   ⇓QR
      c. [CP[IP[NP every man$_i$ [NP t$_i$'s mother]]$_j$ [IP t$_j$ supports him$_i$]]]

Let us begin with (144). QR first applies to *every man*, adjoining it to its dominating NP, as in (144b), and then QR adjoins the whole NP to IP as in (144c). Suppose QR is constrained by (143). Then, the mapping from (144a) to (144b) is blocked since it involves adjunction to the subject NP argument. One might argue that LF representation (131) can be obtained even if QR is constrained by (143), supposing the derivation shown in (145). First, QR applies to the subject NP *every man's mother*, adjoining it to IP, as in (145b). Then QR adjoins *every man* to this LF raised NP, as in (145c). Since the LF raised NP is not an argument but an operator, (143) cannot prohibit the mapping from (145b) from (145c). Note, however, that this mapping would violate other independently motivated principles such as the Strict Cyclicity Condition or its more general version, the Target Extension Condition advanced in Chomsky 1992.

What we have shown above is that May's theory of LF must be equipped with condition (143) and restrict the application of (143) to the movement taking place at S-Structure. But such a restriction is inconsistent with the spirit of the entire program that

movement is not determined by specific rules or constructions, unless it has an independent reason or its effects are restrained at LF on independent grounds.

May's (1985) theory of bound anaphora runs into a more serious problem when we consider the contrast shown in (146).

(146) a. John interviewed every student$_i$ or his$_i$ mother.
'For every student x, John interviewed x or x's mother.'

b. *Every student$_i$ and Mary criticized him$_i$.
'For every student x, x and Mary criticized x.'

As we noted before, bound anaphora is possible in (146a). That is, the pronoun *his* is construed as a variable bound by *every student*. By contrast, (146b) does not allow for the bound variable interpretation of *him*. There is no way to explain the contrast between (146a) and (146b) in May's theory. Exploiting the strategy of adjunction to NP, one may account for the availability of the bound variable construal of *his* in (146a). Free adjunction to NP and pied piping will map (146a) onto the following LF representation:

(147) [$_{CP}$[$_{IP}$[$_{NP}$ every student$_i$ [$_{NP}$ t$_i$ or his$_i$ mother]]$_j$ [$_{IP}$ John interviewed t$_j$]]]

In (147) the quantified NP *every student* adjoined to the coordinate NP m-commands the pronoun, since the first maximal projection DOMINATING it is CP. Then the bound anaphora condition (130) guarantees that the pronoun may be construed as a variable bound by *every student*, as desired. However, the same mechanisms of bound anaphora will make an inaccurate prediction in the case of (146b). By the same token, (146b) would be mapped onto the LF representation in (148).

(148) $[_{CP}[_{IP}[_{NP}$ every student$_i$ $[_{NP}$ t$_i$ and Mary]]$_j$ $[_{IP}$ t$_j$ criticized him$_i$]]]

As with (147), the m-command domain of *every student* is defined as CP, which DOMINATES the pronoun. Therefore, it would be wrongly predicted that bound anaphora is possible in (146b), contrary to fact. The dilemma that May's theory encounters is made worse by the fact that once we explain the impossibility of bound anaphora in (146b) by barring adjunction to coordinate NPs, there is no way to explain the possibility of bound anaphora in (146a).[21]

Bach and Partee's (1980) example (123), repeated as (149), also reveals one inadequacy of May's theory of bound anaphora.

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[21]Apart from the bound anaphora problem, whether adjunction is possible to a coordinate NP at LF is a controversial subject in the theory of movement. Chomsky (1981:279, fn 8) notes that sentence (ia) is ungrammatical, whereas many people find it acceptable:

(i)   a.   I wonder who$_i$ wrote $[_{NP}$ which textbook$_j$ and that novel]$_k$.

        b.   I wonder $[_{CP}[_{NP}$ which textbook$_j$ $[_{NP}$ who]$_i$]$_i$ $[_{IP}$ t$_i$ wrote $[_{NP}$ t$_j$ and that novel]$_k$]]

        c.   I wonder $[_{CP}[_{NP}[_{NP}[_{NP}$ which textbook]$_j$ $[_{NP}$ t$_j$ and that novel]$_k$] $[_{NP}$ who]$_i$]$_i$ $[_{IP}$ t$_i$ wrote t$_k$]]

Assume that at LF a wh-in-situ moves and adjoins to the wh-phrase moved at S-Structure, and then they undergo Higginbotham and May's (1980) Absorption. Then, (ia) may have the two derivations described by (ib) and (ic). In the former derivation, the first conjunct *which textbook* is extracted out of the coordinate NP, violating the CSC. In the latter derivation, adjunction to the coordinate structure takes place, avoiding the CSC. Then the whole adjunction structure is adjoined to the wh-phrase *who* without violating any constraint or principle.
    One may argue that those who do not accept (ia) do not allow adjunction to coordinate NPs, but those who accept it allow that movement. But this argument cannot be fully justified. Whether they accept (ia) or not, people reject the following sentence:

(ii)   *I wonder who$_i$ wrote $[_{NP}$ which textbook$_j$ or that novel]$_k$.

The contrast between (ia) and (ii) seems to show that extractability from a coordinate NP is not explained only in terms of adjunction.

(149) Every student claimed that [one of his professors]$_i$ was a genius in order to influence her$_i$.

We noted before that bound anaphora is possible when *one of his professors* takes scope over *claimed* but under *every student*. If this relative scope relation is structurally represented at LF, *one of his professors* should be raised to the A'-position that m-commands *claimed*. This entails that the QR of *one of his professors* must leave a trace in the subject position of the complement clause, as in (150).

(150) [$_{CP}$[$_{IP}$ every student$_j$ [$_{IP}$ t$_j$ [$_{VP}$ [$_{NP}$ one of his professors]$_i$ [$_{VP}$ claimed [$_{CP}$ that [$_{IP}$ t$_i$ was a genius]]]]] in order to influence her$_i$]]]

The VP-adjoined quantifier *one of his professors* m-commands *claimed* since the first maximal projection DOMINATING the former, CP, DOMINATES the latter. But CP also DOMINATES the pronoun *her*. Thus condition (130) ensures that bound anaphora is possible in (150). However, the LF representation (150) violates the Empty Category Principle which says that empty categories must be theta-governed or antecedent-governed. The trace t$_i$ in the subject position of the complement clause is not theta-governed. Nor is it antecedent-governed due to the presence of the complementizer *that*. Again, May's theory of bound anaphora fails to predict where pronouns are interpreted as variables.

Thus far we have discussed two representative LF theories of bound anaphora and pointed out that many of the examples that are supposed to support those theories still pose problems for them. Without further argument, we conclude that none of the LF theories can explain all of the occurrences of bound anaphora we have considered. Note that a surface-based theory like Reinhart 1983a, b also fails to account for the

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availability of bound anaphora in many of the sentences discussed so far. This is borne out by the following examples:

(151) a. Every man$_i$'s mother supports him$_i$.
   b. Someone from every city$_i$ despises it$_i$.
   c. We will sell no wine$_i$ before its$_i$ time.

Although the pronouns are not c-commanded at surface structure by their quantified antecedents in these sentences, they all allow for bound variable anaphora, contrary to the prediction that (118) makes. What we have shown is that neither a surface-based theory nor an LF-based theory gives a satisfactory account of bound anaphora. The examples in (152) and (153) give more decisive evidence for our claim.

(152) ?They invited each NBA team$_i$'s owner or its$_i$ head-coach.
   'For each NBA team x, they invited x's owner or x's head-coach.'

(153) ?Every student$_i$ and his$_i$ mother told his$_i$ teacher that he$_i$ was competent.
   'For every student x, x and x's mother told x's teacher that x was competent.'

Although there is some uneasiness, both sentences seem to sanction bound anaphora. (152) shows that regardless of how deep a quantified NP is embedded in the first conjunct NP, it may bind the pronoun embedded in other conjunct NPs. We observe another interesting fact in (153): if a quantified NP has scope over a dominating coordinate NP, it may bind not only the pronouns dominated by the coordinate NP but also the pronouns c-commanded by it.

The availability of bound anaphora in examples like (152) and (153) just means that bound pronouns or RDIs must be within the "semantic scope" of their antecedent

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and that this semantic scope cannot be represented in terms of a structural notion, no matter how it is defined and applied. It is also true that an adequate semantic theory has not been developed yet to represent the required semantic scope for all bound anaphora cases. We believe, however, that if such a semantic theory is successfully formulated, it will give a better account than a structure-based theory of bound anaphora. Nonetheless, we will not address the issue of how to build a theory of bound anaphora here, just as we deliberately avoided giving an account of all possible occurrences of RDIs in the previous chapter. Instead we will restrict our attention to the examples that a crossover constraint is said to rule out. In other words, we are not concerned with where bound anaphora is obtained but with where it is NOT obtained.

The problem with the condition (118) and the Bijection Principle (102), repeated as (154) and (155), respectively, is that they are formulated as a sort of necessary condition on bound anaphora.

(154) To be construed as variables, pronouns must be in the c-command domain of definite NPs, quantified NPs, and wh-traces at surface structure.

(155) Bijection Principle

Each operator must A'-bind exactly one variable, and each variable must be A'-bound by exactly one operator.

Let us now consider again the examples that we argued exhibit crossover effects. They are repeated here, as in (156)-(158).

(156) a. *He$_i$/Himself$_i$ loves everyone$_i$.
       b. *Who$_i$ did he$_i$ say that Mary loved?

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(157) a. *His$_i$ mother loves everyone$_i$.

   b. *Who$_i$ did his$_i$ mother say that Mary loved?

(158) a. *His$_i$ supporters admired every senator$_i$ and Ross.

   'For every senator x, x's supporters admired x and Ross.'

   b. His$_i$ mother loved John$_i$.

   *'John is the person who was loved by his mother.'

   c. His$_i$ mother loves John$_i$ and no one else/John$_i$ and only John$_i$.

   *'John is the only person that is loved by his own mother.'

   d. His$_i$ mother loves John$_i$ more than Bill.

   *'His$_i$ mother loves John$_i$ more than Bill$_j$'s mother loves Bill$_j$.'

As a necessary condition on bound anaphora, (154) correctly predicts that no bound variable interpretation of an RDI is possible in the above sentences. At the same time, however, (154) incorrectly rules out a bound reading in sentences like (151)-(153). The Bijection Principle (155) makes poorer predictions. It is only (156) and (157) that it accounts for correctly. Due to independent reasons, (155) cannot tell whether or not bound anaphora is possible in (158). Like (154), it also incorrectly predicts the lack of a bound reading in (151)-(153).

Our discussion of (156)-(158) suggests that the effects of crossover must be ascribed to a principle distinct from a necessary condition on bound anaphora. In fact, the examples (156)-(158) manifest one linguistically significant generalization. Before we spell out what this generalization is, we need to examine further examples of what we may think illustrate crossover effects. Let us consider the contrast shown in (159).

(159) a. Some daughter of every author$_i$ hated some relatives of his$_i$ wife.

   b. *Some relatives of his$_i$ wife hated some daughter of every author$_i$.

The condition (154) predicts that neither sentence sanctions the binding of the pronoun *his* by *every author* since the latter fails to c-command the former. The Bijection Principle (155) makes the same prediction. Suppose QR adjoins a quantified NP to IP. After QR is applied repeatedly, (159a) and (159b) would be mapped onto the respective LF representations (160) and (161).

(160) $[_{IP}[_{NP}$ every author$]_i$ $[_{IP}[_{NP}$ some daughter of $t_i]_j$ $[_{IP}[_{NP}$ some relatives of his$_i$ wife$]_k$ $[_{IP}$ t_j hated $t_k]]]]$

(161) $[_{IP}[_{NP}$ every author$]_i$ $[_{IP}[_{NP}$ some daughter of $t_i]_j$ $[_{IP}[_{NP}$ some relatives of his$_i$ wife$]_k$ $[_{IP}$ t_k hated $t_j]]]]$

In both representations the quantified NP *every author* locally A'-binds its trace t_i and the pronoun *his* contained in the operator phrases adjoined to IP, violating the Bijection Principle. Contrary to the prediction that (154) and (155) make, (159a) allows for bound anaphora. This shows again that the lack of bound anaphora in (159b) is not due to (154) or (155), which we think of as a sort of necessary condition on bound anaphora, but to an independent constraint that prohibits bound anaphora in (156)-(158).

Although (154) and (155) make the same prediction regarding (159), there is a case in which only the former gives a correct result. Consider (162).

(162) a. Every author$_i$ criticized some relatives of his$_i$ wife.
       b. *Some relatives of his$_i$ wife criticized every author$_i$.

The condition (154) correctly predicts that bound anaphora is possible in (162a) but impossible in (162b). As noted by Haïk (1984) and Higginbotham (1987), however,

the Bijection Principle (155) incorrectly predicts the absence of bound anaphora in both sentences. After iterative applications of QR, (162a) and (162b) will be mapped onto the respective LF representations (163a) and (163b).

(163) a. $[_{IP}[_{NP}$ every author$]_i$ $[_{IP}[_{NP}$ some relative of his$_i$ wife$]_j$ $[_{IP}$ t$_i$ hated t$_j$$]]]$

b. $[_{IP}[_{NP}$ every author$]_i$ $[_{IP}[_{NP}$ some relative of his$_i$ wife$]_j$ $[_{IP}$ t$_j$ hated t$_i$$]]]$

In the LF representations in (163), the quantified NP *every author$_i$* binds its trace t$_i$ and the pronoun *his$_i$* contained in the operator phrase. Hence both representations violate the Bijection Principle.[22] Again, this shows that the ungrammaticality of (162b), which must be paralleled by that of (159b), cannot be accounted for by a condition like (155). As far as (162) is concerned, it may be accounted for by (154). As we argued, however, (154) inadequately bans bound anaphora in other grammatical sentences. To explain the absence of bound anaphora in (162b), we should have recourse to a different constraint.

To summarize, even if (154) and (155) correctly explain the lack of bound anaphora in (156), (157), (158), (159b), and (162b), they give rise to a problem in the other cases and the problem results from their formulations as a sort of necessary condition on bound anaphora. Thus, the best way to avoid the problem is to find the principle that accounts for the lack of bound anaphora in these sentences without directly constraining all instances of bound anaphora. Indeed, the crossover examples in question express one linguistically significant generalization that helps us characterize

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[22]As pointed out by Higginbotham (1983), even if (155) is so modified as to admit (163a) as a well-formed LF representation of (162a), it is still problematic since (163a) and (163b) are identical except for the relative order between the traces t$_i$ and t$_j$. There seems to be no simple way to discriminate the two LF representations, one of which must be ruled out.

crossover properly. We will discuss it in detail in the following section.

3.3.4. A Uniform Characterization of Crossover and the PRA

We begin with an observation that putting aside the wh-questions (156b) and (157b), for each of the other crossover sentences in (156)-(158), there is a corresponding grammatical sentence, as we will see below:

(164) a. *He$_i$/Himself$_i$ loves everyone$_i$.
      b. Everyone$_i$ loves himself$_i$.

(165) a. *His$_i$ mother loves everyone$_i$.
      b. Everyone's$_i$ mother loves him$_i$.

(166) a. *His$_i$ supporters admired every senator$_i$ and Ross.
      b. Every senator$_i$ admired his$_i$ mother and Ross.

(167) a. His$_i$ mother loved John$_i$.   (* on the bound reading)
      b. Everyone's$_i$ mother loved him$_i$.

(168) a. His$_i$ mother loves John$_i$ and no one else.   (* on the bound reading)
      b. Everyone$_i$'s mother loves him$_i$ and no one else.

(169) a. His$_i$ mother loves John$_i$ more than Bill.   (* on the bound reading)
      b. Everyone$_i$'s mother loves him$_i$ more than Bill.

(170) a. *Some relatives of his$_i$ wife hated some daughter of every author$_i$.
      b. Some daughter of every author$_i$ hated some relatives of his$_i$ wife.

(171) a. *Some relatives of his$_i$ wife criticized every author$_i$.
      b. Some relatives of every author$_i$ criticized his$_i$ wife.

The crucial point we notice here is that if the (a) sentences were grammatical, they would have the same structure as their grammatical counterpart. This leads us to regard

crossover as a restriction on the dependency between referentially dependent NPs and their antecedents that follows from the slight revision of AAU in (172).

(172) Let an NP X antecede an RD NP Y in a sentence S. If the result of replacing Y with an RA NP Y' and X with an RD NP X' preserves the structure of S, Y' cannot be understood as an antecedent of X'.

A word about (172) is in order here. As we showed in Ch. 2, RD NPs include not only RDIs like R-pronouns and bound pronouns but also syntactically complex NPs that properly contain such RDIs. This enables us to explain the lack of bound anaphora in the (a) sentences of (164)-(171) in the uniform way, in terms of the PRA from which we deduce the effects of AAU (172).

Let us begin with the SCO example (164a). In Ch. 2 we showed how to derive the ungrammaticality of (164a) with *himself*. In a binary nuclear sentence like (164), *himself* is used as an RDI. Given (164b), the referential autonomy function for English, $RAF_{English}$, must be defined to identify a preverbal NP as RA in those sentences isomorphic to (164b). Suppose (164a) with *himself* is grammatical. Then empirically observed language-specific facts ensure that (164a) with *himself* and (164b) are isomorphic. Since $RAF_{English}$ is isomorphism invariant, it must identify *himself* as an RA NP in (164a), leading to a contradiction. Hence (164a) with *himself* violates the PRA. What remains is to account for the ungrammaticality of (164a) with *he*. As we mentioned before, pronouns may refer to or function as bound variables. We assume that bound variable pronouns but not deictic pronouns are RD. Since crossover is a restriction on binding, we are not concerned with deictic pronouns. Suppose then that (164a) with *he* is grammatical. Then, $RAF_{English}$, which must identify *everyone* as an RA NP in (164b), must identify *he* as an RA NP in this sentence. But *he* is not RA, as

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we assumed, leading to a contradiction. Since $RAF_{English}$ fails to identify an NP as RA in (164a) with *he*, it violates the PRA. In order for the PRA to be satisfied, the pronoun must be interpreted deictically.

Let us now turn to the WCO cases. We first observe that the (a) sentences in (165)-(169) all have an NP of the form *his* N as subject. Such NP occurrences are treated as RD when they are used as object and when *his* is construed as a variable. Consider (173).

(173) a. Everyone$_i$ criticized [his$_i$ mother].
　　　b. Someone$_i$ criticized [his$_i$ mother].

As we showed in Ch. 2, the denotation of an RA NP may meet the Accusative Extensions Condition (174), but the denotaion of an RD NP may not.

(174) Accusative Extensions Condition (AEC)

A function F from binary relations to properties is the accusative extension of a basic function iff for all binary relations R, S and all objects a, b, if aR = bS, then a $\in$ F(R) iff b $\in$ F(S) where aR $=_{df}$ {x: aRx}.

Returning to (173), suppose everyone criticized exactly the same objects that someone did. Then it may be that (173a) is false but that (173b) is true. This happens in a situation like (175).

(175) There are only three male individuals, John, Bill, and Sam, in the model. They have different mothers. They all criticized Mary, who happens to be John's mother. They, however, criticized no one else.

We have shown that NPs of the form *his* N may be RD when they occur in the object position. It is logically possible to interpret them as RD when they occur in the subject position, even though languages like English do not grant this logical possibility, as shown by the (a) sentences in (165)-(169). As an illustration, let us consider (176).

(176) a.   [His$_i$ mother] loves John$_i$.
       b.   [His$_i$ mother] loves Bill$_i$.

To say that the NP *his mother* in (176a) is referentially dependent on *John* is to say that the truth of (176a) depends on both who John is and what objects are such that their mother loves John. Put differently, its denotation fails to meet the following Nominative Extensions Condition:

(177) Nominative Extensions Condition (NEC)

       A function F from binary relations to properties is the nominative extension of a basic function iff for all binary relations R, S and all objects a, b, if Ra = Sb, then a $\in$ F(R) iff b $\in$ F(S) where Ra =$_{df}$ {x: xRa}.

Suppose the objects whose mother loves John are the same as the objects whose mother loves Bill. This does not guarantee that (176a) and (176b) have the same truth value. Let Mary be John's mother and let Sue be Bill's mother. If Sue is the only person that loves John, and she is also the only person that loves Bill, (176a) is false, but (176b) is true.

We can now infer the absence of bound anaphora in the (a) sentences of (165)-(169) from empirically observed language-specific facts. Suppose, contrary to fact,

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that (165a) and (167a) are grammatical. Independent conditions will ensure that they are isomorphic to (165b), a grammatical sentence given empirically. Then, *RAF_English*, which must identify *everyone's mother* as an RA NP in (165b), must identify *his mother* as an RA NP in (165a) and (167a). But *his mother* is not RA when the pronoun is interpreted as a bound variable, as we showed above. This leads to a contradiction. Hence the PRA is violated in (165a) and (167a). The pronouns in these strings must be interpreted deictically in order to satisfy the PRA. In the same manner mentioned above, we can infer the unavailability of bound anaphora in the other (a) examples. Here we will show how to do so, taking (166) as an example. Consider first the following pair:

(178)   a.   Every linguist$_i$ admired [his$_i$ mother and Ross].
         b.   Some philosopher$_i$ admired [his$_i$ mother and Ross].

Suppose every linguist admired exactly the same objects that some philosopher did. As expected, this does not guarantee that (178a) and (178b) have the same truth value. In a situation like (179) below, the former is false, but the latter is true.

(179)   There are only three linguists, John, Bill, and Sam, in the model. They have different mothers. There is only one philosopher in the model. Sam happens to be a linguist and philosopher. John, Bill, and Sam admired Sam's mother and Ross, but no one else.

This shows that an NP like *his mother and Ross* fails to meet the AEC (174) and thus is referentially dependent. So it guarantees that *RAF_English* must be defined to identify the subject NP as RA in a sentence like (166b). Suppose, contrary to fact, that (166a)

is grammatical. Then the two strings must be isomorphic. Since $RAF_{English}$ is isomorphism invariant, it must identify *his supporters* in (166a) as RA, leading to a contradiction. Hence (166a) violates the PRA since $RAF_{English}$ fails to identify an RA NP in this sentence.

Thus far we have shown how to account for the lack of bound anaphora in the (a) sentences of (164)-(169) in terms of the PRA plus certain language-particular facts. Before we explain the absence of bound anaphora in (170a) and (171a), we need to show that an NP like *some relatives of his wife* is treated as RD when *his* is construed as a variable. Let us consider the pair in (180).

(180) a. Some daughter of every author$_i$ hated some relatives of his$_i$ wife.
       b. Some daughter of every professor$_i$ hated some relatives of his$_i$ wife.

Suppose some daughter of every author hated exactly the same objects that some daughter of every professor did. Then it may be that (180a) is false but that (180b) is true. This is borne out by the following situation:

(181) There are only two authors, John and Bill, in the model. John has exactly one daughter named Susie, and Bill, exactly one daughter named Barbara. Susie hated Peter, one of her mother's relatives, and Barbara hated none of her mother's relatives. There is only one professor, Bob, in the model. Bob has exactly one daughter named Jill. Jill hated Peter, who happens to be also one of her mother's relatives.

Now we can infer the ungrammaticality of (170a) from (170b), which is given empirically. Suppose, contrary to fact, that (170a) is grammatical. Then, $RAF_{English}$, which must identify *some daughter of every author* in (170b) as RA, must identify

some relatives of his wife in (170a) as RA since *RAF*$_{English}$ is isomorphism invariant and since (170a) and (170b) must be isomorphic. But the expression *some relatives of his wife* is not RA when the pronoun is construed as a variable. Since this leads to a contradiction, (170a) would violate the PRA. The same logic of argument applies to (171). If we assume that (171a) is grammatical, we end up with the contradiction that *some relatives of his wife* in (171a) is RA. Since the PRA is not violable, our initial assumption that (171a) is grammatical on the bound reading should be abandoned.

In this section we advanced a unified account of SCO and WCO in terms of the PRA plus certain language-particular facts. In handling the crossover examples (164)-(171), our account suffers from none of the empirical problems associated with the Reinhartish condition on bound anaphora (154) and the Bijection Principle (155). This is so because our PRA constrains the presence of possible antecedents of RD NPs, i.e., RA NPs, rather than the distribution of RD NPs themselves.

Our unified account, however, cannot explain the well-known fact that the judgment involving SCO is worse than the judgment involving WCO. We simply suggest that this difference may be attributed to the different perceptual status of RDIs and syntactically complex RD NPs. RDIs such as *himself* or *he/him* are purely nonreferential since they are construed as variables. Syntactically complex RD NPs such as *both himself and Mary* and *some relatives of his wife* are not purely nonreferential in that their denotations are composed of variables and something else. It appears that the structural complexity involved in such RD NPs weakens the effect of AAU.[23]

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[23]For the suggestion regarding the perceptual difference between SCO and WCO, I am indebted to Stowell, to appear.

On the basis of the following descriptive generalization for WCO:

(182)　In an LF configuration where a category C A'-binds a pronoun P and a trace T, P may not be contained in an argument phrase XP that c-commands T.

Stowell (to appear) proposes to reduce WCO to a special case of SCO. Elaborating on the slash-indexing mechanism introduced by Haïk (1984) and Safir (1985), he revises Principle C so that it blocks a trace with the [-pronominal] index from being c-commanded by the argument NP whose inherent or slashed index with [+pronominal] is the same as the index of the trace. Under the theory of slash-indexing, (165a) will be assigned the following LF representation:

(183)　$[_{IP}$ everyone$_i$ $[_{IP}[_{NP}$ his$_i$ mother$]_{j/i[+pronominal]}$ loves t$_i]]$

In (183) *his mother*$_{j/i[+pronominal]}$ c-commands t$_i$, violating Principle C. This analysis gives a correct result in the cases of (164), (165), (170), and (171). However, it cannot explain the lack of bound anaphora in the (a) sentences of (166)-(169), since no appropriate LF representations to which Principle C applies are generable for the reasons indicated before.

3.4.　Conclusions

In this chapter we further motivated the PRA from cross-linguistic and cross-theoretical points of view. In comparison with some previously proposed constraints on the AA

relation, our approach was shown to be more conceptually motivated and restricted. It also provided an empirically better account of the asymmetry of the AA relation in languages like Batak and Samoan. Without having resort to any pretheoretical notions of grammatical function and structure, we successfully derived the claim that anaphors and their antecedents are asymmetrically distributed in the binary nuclear sentences in those languages. Characterizing crossover as another manifestation of the AAU, we proposed a unified analysis of SCO and WCO in terms of the PRA plus empirically given language-specific facts. The proposed account provided a natural explanation of crossover without giving rise to the problems related to bound anaphora.

Chapter 4

Extending the Principle of Referential Autonomy

4.1. Introduction

In this final chapter we discuss some putative counterexamples to the Principle of Referential Autonomy (PRA). These counterexamples show that the formulation of the PRA in Ch. 2, repeated in (1) below, is not general enough to fully deduce the Anaphora Asymmetry Universal (AAU) in (2).

(1)   Principle of Referential Autonomy

For each natural language L, there is an isomorphism invariant function f_L such that

i.   Dom(f_L) includes the nuclear sentences of L, and

ii.   For each nuclear sentence S, $f_L(S)$ is an independent RA NP occurring in S.

(2)   Anaphora Asymmetry Universal (AAU)

Let an NP X antecede a referentially dependent (RD) NP Y in a sentence S. If the result of replacing Y with a referentially autonomous (RA) NP Y' and X with an RD NP X' preserves the structure of S, Y' cannot be understood as an antecedent of X'.

PRA (1) says that for each language L, each nuclear sentence S of L contains at least one independent RA NP, and L provides a structurally uniform way of identifying the

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required RA NP in each *S*. In the previous chapters 2 and 3, we restricted attention to binary nuclear sentences and showed that if a language *L* admitted of a *symmetric* anaphor-antecedent (AA) relation, *L* would no longer structurally identify an NP in those nuclear sentences as RA, violating the PRA. For each *n*-ary nuclear sentence, there must be an NP occurrence whose referential autonomy is guaranteed by the PRA. Moreover, the principle requires that any AA relation involving such an NP occurrence is asymmetric, as desired. Our approach, however, encounters a problem when we examine AA relations that do not involve an NP identified by the PRA as an RA NP occurring in a nuclear sentence. As we shall see below, this type of AA relation still exhibits the AAU effects. Discussion of two representative cases of such relations in sections 4.2 and 4.3 suggests that we must generalize our formulation of the PRA in (1).

To this end, we first generalize the notion "referentially autonomous" to other categories. This generalization enables us to treat nuclear sentences as a specific type of RA expression in that the computation of their interpretation, which is based solely on the interpretations of their parts and the way they are formed, is *complete*. We then propose a reformulation of the PRA as a principle that constrains the presence of RA expressions in any arbitrary type of RA phrases, not just in nuclear main clauses.

4.2. Two-Complement Verbs and the Distribution of Anaphors

As pointed out to me by Anna Szabolcsi (personal communication), ternary nuclear sentences headed by a two-complement verb like *introduce* pose a problem for (1). The paradigms in (3)-(7) exhaust all possible types of nuclear sentences we can generate

with *introduce.*

(3) a. *John* introduced *Mary* to *Bill.*   three RA NPs
     b. *Himself$_i$ introduced$_i$ himself$_i$ to himself$_i$.   no RA NP

(4) a. *John*$_i$ introduced *Mary* to himself$_i$.   two RA NPs
     b. *Himself$_i$ introduced *Mary* to *John*$_i$.   two RA NPs

(5) a. *John*$_i$ introduced himself$_i$ to *Mary.*   two RA NPs
     b. *Himself$_i$ introduced *John*$_i$ to *Mary.*   two RA NPs

(6) a. *John*$_i$ introduced himself$_i$ to himself$_i$.   one RA NP
     b. *Himself$_i$ introduced *John*$_i$ to himself$_i$.   one RA NP
     c. *Himself$_i$ introduced himself$_i$ to *John*$_i$.   one RA NP

(7) a. *John* introduced *Mary*$_i$ to herself$_i$.   two RA NPs
     b. **John* introduced herself$_i$ to *Mary*$_i$.   two RA NPs

The contrast between (3a) and (3b) is trivial. Unlike the former, the latter contains no RA NP, violating the PRA. The contrast between the grammatical strings and their ungrammatical counterparts in (4)-(6) illustrates the AAU effects and motivates (8).

(8) For any nuclear sentence *S*, $RAF_{English}(S)$ = the external NP of *S* = the NP in [SPEC, IP] of *S* = the NP interpreted as a nominative extension.

Independent mechanisms such as the subcategorization feature of the verb guarantee that if the (b) strings in (4) and (5) are grammatical, they must have the same structure as their corresponding (a) strings. Hence, $RAF_{English}$ identifies *himself* as RA in the former strings in accordance with (8). Empirical study, however, shows that Standard American English does not allow *himself* to be used as an RA NP in such strings. Since the PRA is an inviolable universal constraint on semantic interpretation,

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the contradiction we have leads us to conclude that (4b) and (5b) cannot be grammatical, preserving the same structure as their respective (a) sentences. In each string in (6), the two occurrences of *himself* are intended to be "anteceded" by the same RA NP. Only (6a) is grammatical. Our explanation of the other ungrammatical strings is the same as before. Both ungrammatical strings have a reflexive pronoun as their external NP. If they are grammatical, then they must have the same structure as (6a); no other structure can be assigned to them. Therefore, $RAF_{English}$ must structurally identify the first occurrence of *himself* as RA in these strings, but *himself* is not RA. Since the PRA is violated, they cannot be grammatical sentences.

As formulated in (1), however, the PRA cannot explain the contrast between (7a) and (7b). As before, if the latter string is grammatical, it must be isomorphic to the former. The referential autonomy function, $RAF_{English}$, identifies *John* as RA in those strings. Since *John* is referentially autonomous, these strings conform to the PRA. Thus our account incorrectly predicts that both (7a) and (7b) are grammatical. The crucial point to note here is that the AAU (2) correctly predicts that only one of the strings in (7) is grammatical. Since string (7a) is empirically given as a grammatical sentence, the AAU rules out (7b) as an ungrammatical sentence. This means that the PRA (1) must be generalized to fully deduce the AAU.

4.3. Coordination and Pronominal Binding

In the preceding section we showed that in certain two-complement verb contexts, the PRA (1) but not the AAU (2) makes an inaccurate prediction. Such an undesirable result does not obtain only in those two-complement verb contexts. Coordinate

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structures of various sorts provide other cases in which our principle fails to deduce the AAU.

In Ch. 3 we argued that bound anaphora is possible within coordinate NP structures. Let us first consider the following example:

(9)   Mary interviewed [$_{NP}$ every student$_i$ or his$_i$ mother].
        'For every student x, Mary interviewed x or x's mother.'

As the translation shows, the pronoun *his* in (9) is bound to the quantified NP *every student*. We argued that this type of binding must occur within the coordinate NP due to Ross's (1967) Coordinate Structure Condition. As Reinhart (1983a:134, fn. 9) notes, bound anaphora is blocked when the AA relation is reversed:

(10)   a.   Each of the employees$_i$ and his$_i$ wife will be invited to the party.
             'For each of the employees x, x and x's wife will be invited to the party.'

        b.   *His$_i$ wife and each of the employees$_i$ will be invited to the party.
             'For each of the employees x, x's wife and x will be invited to the party.'

Unlike (10a), (10b) does not allow the pronoun *his* to be bound to the quantified NP *each of the employees*. Likewise, no bound variable construal of *his* is allowed in (11) below.

(11)   *Mary interviewed [$_{NP}$ his$_i$ mother or every student$_i$].
        'For every student x, Mary interviewed x's mother or x.'

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It is obvious from work on English grammar that if (11) is grammatical, then it must be isomorphic to (9). It does not matter whether the structure of a coordinate NP is symmetric or asymmetric: either option can be equally available for the strings in question. Whereas the AAU (2) correctly predicts that only one of the strings is grammatical, the PRA (1) incorrectly predicts that both are grammatical since they have the same structurally identified RA NP, *Mary*.

Reinhart (1987:138) observes that bound anaphora is possible even within coordinate VP structures like (12), her (24b) and (24c).

(12) a. Lucie [$_{VP}$ read each book$_i$ and wrote a review about it$_i$].
      b. Felix [$_{VP}$ kissed every woman$_i$ and invited her$_i$ to dance].

In each sentence the pronoun contained in the second VP conjunct is bound to the quantified NP contained in the first conjunct.[1] Now consider the contrast between (13a) and (13b).

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[1]It is worth noting that the availability of the bound variable construal of the pronouns in (12) gives evidence for the view that all conjoined constituents of various kinds are directly generated, not constructed via the Conjunction Reduction Transformation. As noted by many researchers, bound anaphora is not possible across a sentence boundary. Consider (i).

(i) Few congressmen$_i$ admire Kennedy, and they$_i$ are very junior.

Evans (1980) argues that (i) allows no such bound variable reading as 'There are few congressmen such that they admire Kennedy and they are very junior', but illustrates what he calls an "E-type" pronoun. According to him, (i) may be paraphrased as 'Few congressmen admire Kennedy, and the congressmen who admire Kennedy are very junior'. Let us now consider (ii).

(ii) a. *?Lucie read each book$_i$ and she wrote a review about it$_i$.
      b. *?Felix kissed every woman$_i$ and he invited her$_i$ to dance.

No bound variable reading is possible in either sentence.

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(13)   a.   Lucie [$_{VP}$ criticized every teacher$_i$ and insulted his$_i$ wife].
       b.   *Lucie [$_{VP}$ criticized his$_i$ wife and insulted every teacher$_i$].

Again, if (13b) is grammatical, then it must have the same structure as (13a). Both strings satisfy the PRA (1), since the NP *Lucie*, structurally identified as RA in those strings, is in fact referentially autonomous.

Note in passing that the existence of bound anaphora within coordinate structures seems to depend on the semantic properties of conjoined phrases. Many speakers of English do not allow a monotone decreasing NP, whether it is a conjoined phrase itself or contained in a conjoined phrase, to bind a pronoun contained in another conjoined phrase. They have difficulty obtaining bound anaphora in sentences like (14).

(14)   a.   ??[$_{NP}$ None of the employees$_i$ or his$_i$ wife] will be invited to the party.
       b.   ??Lucie [$_{VP}$ criticized no student$_i$ or insulted his$_i$ teacher].

As we emphasized in Ch. 3, we are not concerned with how to formulate the necessary condition on bound anaphora, but with how to explain the unavailability of bound anaphora that results from the AAU.

4.4.   The Extended Principle of Referential Autonomy

We have shown so far that the PRA, as formulated in (1), cannot fully deduce the effects of the AAU (2). In this section we extend the PRA in (1) on the basis of the data discussed in the previous two sections 4.2 and 4.3.

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Let us begin with sentences containing a two-complement verb. (15) illustrates two more types of two-complement verbs.

(15) a. John introduced every girl$_i$ to her$_i$ date.
      b. *John introduced her$_i$ date to every girl$_i$.

(16) a. John denied each worker$_i$ his$_i$ paycheck.
      b. *John denied its$_i$ owner each paycheck.

(17) a. John talked to every patient$_i$ about his$_i$ family.
      b. *John talked to his$_i$ family about every patient$_i$.

We already discussed the sentence type shown in (15). The verb *introduce* is subcategorized for by NP followed by PP. Given (15a), in which the quantified complement NP binds the pronoun in the PP complement, we cannot interchange the antecedent and the pronoun, preserving the same structure. In Ch. 3 we showed that the NP that contains a pronoun interpreted as a variable, but not its antecedent, is referentially dependent. The sentences in (16) are headed by the verb *deny*, which selects two complement NPs. As Barss and Lasnik (1986) observe, in the sentences with a *deny*-type verb, the second complement NP may be referentially dependent on the first complement NP, but not vice versa. Notice that if (16b) is grammatical, then it must be isomorphic to (16a). The AAU predicts that only one of them can be grammatical. It does not allow that both can be grammatical on the bound variable reading in question. The strings in (17) have the verb *talk*. This type of verb is subcategorized for by two PPs. The contrast between (17a) and (17b) suggests that the NP occurring in the second complement PP may be referentially dependent on the NP occurring in the first complement PP, but not vice versa. Again, it is crucial that (17a) and (17b) are isomorphic if the latter is grammatical. Due to the AAU, only one of

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them may be grammatical. Since (17a) is given empirically as a grammatical sentence, (17b) must be ungrammatical.

The paradigm shown in (15)-(17) reveals one significant generalization. Suppose we treat any expression X as referentially dependent if X contains a referentially dependent NP Y and X does not contain an antecedent of Y, and as referentially autonomous otherwise. Then all of the VPs in (15)-(17) are RA since they contain not only an RD NP but also its antecedent. Furthermore, the contrast between the (a) sentences and their corresponding (b) sentences suggests that there is a uniform way of structurally identifying an expression in those VPs as referentially autonomous. As far as such VPs are concerned, the first complement phrase must be referentially autonomous.

The above observation leads us to reformulate the PRA as follows:

(18)   Extended Principle of Referential Autonomy (EPRA)

For each natural language L, there is an isomorphism invariant function f_L such that

i. $\text{Dom}(f_L)$ includes the RA expressions R of L that contain an NP, and

ii.   For each RA expression R in $\text{Dom}(f_L)$, $f_L(R)$ is an independent RA expression occurring in R.

The domain of the function referred to in (18) includes not only n-ary nuclear sentences but also the VP occurrences in (15)-(17). Note that n-ary nuclear sentences are defined here as independent occurrences of referentially autonomous expressions: If they contain no RD NP, then they are trivially RA. If they contain an RD NP, then they also contain its antecedent. This means that any n-ary nuclear sentence is referentially autonomous. Accordingly, $RAF_{English}$ is given by:

(19)   For any nuclear sentence S, $RAF_{English}(S)$ = the external NP of S. For any RA VP T containing an NP, $RAF_{English}(T)$ = the complement phrase adjacent to the verb.

We can now infer the ungrammaticality of the (b) sentences in (15)-(17). Suppose, for example, that (15b) is grammatical. Then, $RAF_{English}$, which must identify *every girl* occurring in the VP of (15a) as RA, must identify *her date* occurring in the VP of (15b) as RA since $RAF_{English}$ is isomorphism invariant and since the two VPs must be isomorphic. Since *her date* is not RA, $RAF_{English}$ fails to identify an RA expression in the VP of (15b), which must be also RA. This would then violate the EPRA (18). Hence the string in (15b) must be ungrammatical. As a further example, suppose (17b) is grammatical. Then, $RAF_{English}$, which must identify *to every patient* occurring in the VP of (17a) as RA, must identify *to his family* occurring in the VP of (17b) as RA since $RAF_{English}$ is isomorphism invariant and since the two VPs must be isomorphic. But *to his family* is not RA, hence $RAF_{English}$ fails to identify an RA expression in the VP of (17b), which must be also RA. This results in violation of the EPRA (18).[2]

The way we explained the AAU effects in the two-complement verb sentences can be applied to the asymmetry of pronominal binding within coordinate structures.

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[2]Our approach fails to explain why strings (ia) and (ib) are both ungrammatical.

(i)   a.   *John talked about his$_i$ family to every patient$_i$.
        b.   *John talked about every patient$_i$ to his$_i$ family.
        c.   ??John talked about every patient to Mary's mother.

If they are grammatical, then they must be isomorphic. Hence the AAU tells that only one string may be grammatical. We just suggest that (ia) violates the EPRA (18) since *his family* is not RA on the bound reading of the sentence and that a further constraint blocks *his family* from being anteceded by *every patient* in (ib).

Let us consider the contrast between (9) and (11), repeated as (20).

(20) a. Mary interviewed [$_{NP}$ every student$_i$ or his$_i$ mother].
          'For every student x, Mary interviewed x or x's mother.'

      b. *Mary interviewed [$_{NP}$ his$_i$ mother or every student$_i$].
          'For every student x, Mary interviewed x's mother or x.'

Observe first that a coordinate NP like *every student and his mother* may be referentially autonomous. This is borne out by the following sentences:

(21) a. Mary criticized [$_{NP}$ every student$_i$ or his$_i$ mother].
      b. Sue praised [$_{NP}$ every student$_i$ or his$_i$ mother].

Suppose there are only two students in the model, John and Bill. John's mother is Peggy, and Bill's mother, Martha. Suppose further that Mary criticized exactly the same individuals that Sue praised. Then, on the bound variable reading indicated by coindexation, (21a) is true iff (21b) is. The contrast between (20a) and (20b) then suggests that if a coordinate NP is referentially autonomous, its first conjunct NP must be also referentially autonomous.

Let us now consider the contrast shown in (13), repeated as (22).

(22) a. Lucie [$_{VP}$ criticized every teacher$_i$ and insulted his$_i$ wife].
      b. *Lucie [$_{VP}$ criticized his$_i$ wife and insulted every teacher$_i$].

In the discussion of the VPs with a two-complement verb, we treated VP occurrences as referentially dependent if they contain an RD NP but not its antecedent, and as

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referentially autonomous otherwise. This enables us to characterize the whole VP *criticized every teacher and insulted his wife* and the first conjunct VP *criticized every teacher* as RA, but the second conjunct VP *insulted his wife* as RD. The contrast between (22a) and (22b) then suggests that if a coordinate VP is referentially autonomous, its first conjunct VP must be also referentially autonomous.

We accommodate the above two facts concerning coordinate conjunction by extending the referential autonomy function for English defined in (19) as follows:

(23)   For any nuclear sentence S, $RAF_{English}(S)$ = the external NP of S. For any RA VP T containing an NP, $RAF_{English}(T)$ = the complement phrase adjacent to the verb. For any RA boolean compound W conjoined by *and* or *or*, $RAF_{English}(W)$ = the first conjunct phrase, if each conjunct contains an NP.

Given (23), the absence of bound anaphora in (20b) and (22b) is straightforwardly explained. Suppose (20b) is grammatical. Then, $RAF_{English}$, which must identify *every student* occurring in the coordinate NP of (20a) as RA, must identify *his mother* occurring in the coordinate NP of (20b) as RA since $RAF_{English}$ is isomorphism invariant and since the two NPs must be isomorphic. But *his mother* is not RA, hence $RAF_{English}$ fails to identify an RA expression in the coordinate NP of (20b), which must be also RA. This would then violate the EPRA (18). Similarly, (22b) violates the EPRA, hence no bound anaphora is admitted.

4.5. A Final Remark on Referentially Autonomous NPs

In this chapter we formulated the PRA in a very general form to fully deduce the effects of the AAU (2). Generalizing the notion "referentially autonomous" to various grammatical categories, we provided the Extended Principle of Referential Autonomy (18), repeated here:

(18)   Extended Principle of Referential Autonomy (EPRA)

For each natural language L, there is an isomorphism invariant function f_L such that

i. $\text{Dom}(f_L)$ includes the RA expressions R of L that contain an NP, and

ii.   For each RA expression R in $\text{Dom}(f_L)$, $f_L(R)$ is an independent RA expression occurring in R.

(18) is not just a principle that constrains the presence of RA NPs in n-ary nuclear sentences, but a principle that constrains the way we construct an arbitrary type of RA expressions from semantically defined RA NP occurrences. Working together with certain language-specific facts given empirically, this principle provides a simple and natural account of the ill-formed anaphoric dependencies that result from the AAU. Inasmuch as the asymmetry of the AA relation is concerned, we do not need to assume that any pretheoretical notions of theta roles or grammatical functions apply uniformly to languages with different audible structures. Nor do we need to postulate the existence of any prewired structure of a sentence or inaudible levels of structure (e.g., D-Structure, LF, initial strata, etc.)

In concluding this thesis, we would like to make a final remark on referentially autonomous NPs. We suggest that the way we characterize RA NPs derives some

effects of Principle C of the binding theory but that nothing but the EPRA constrains occurrences of RA NPs as a principle of grammar. In the approach taken here, RA NPs are just ones which can occur in unary nuclear sentences. They must be interpreted as generalized quantifiers in those sentences. This means that their denotation does not depend on other NPs in the sentence. Once the denotation of an RA NP is given, it should be preserved irrespective of where the NP occurs or how it is extended. Accordingly, the conditions we impose on the denotations of RA NPs ensure that there is no anaphoric dependency whatsoever in the following sentences:

(24)   a.   *$John_i$ criticized $Mary_i$.
        b.   *$John_i$ criticized $everyone_i$.
        c. $Everyone_i$ criticized $everyone_i$.
        d.   *$John_i$'s mother loves $everyone_i$.

Our account of the referential autonomy of the indexed NPs in each of the sentences in (24) is contrasted with Principle C of the binding theory, which requires that R-expressions must be free in a sentence. By assumption, R-expressions include referential expressions like names, indexicals, and empty categories construed as variables. Since *Mary* is bound by *John* in (24a), the coindexing shown in (24a) violates Principle C, as desired. The binding theory assumes that quantified NPs undergo May's (1977) Quantifier Raising (QR). After QR applies, (24b-d) would be mapped to the LF representations in (25a-c), respectively.

(25)   a. $[_S\ everyone_i\ [_S\ John_i\ criticized\ t_i]]$
        b. $[_S\ every\ student_i\ [_S\ every\ student_i\ [_S\ t_i\ criticized\ t_i]]]$
        b'. $[_S\ every\ student_i\ [_S\ every\ student_j\ [_S\ t_i\ criticized\ t_j]]]$
        c. $[_S\ everyone_i\ [_S\ John_i's\ mother\ loves\ t_i]]$

In (25a) the trace t_i functions as a variable bound by the *everyone* in the operator position. Since the trace is bound by *John*, Principle C rules out (25a) as ill-formed. This guarantees that no anaphoric interpretation can be assigned to (24b), as desired. In the other cases, however, Principle C runs into a problem. In (25b), the trace in the object position is bound by the trace in the subject position. So Principle C rules out the LF representation in (25b) as ill-formed. If (25b) is the only LF representation that represents the meaning of (24c), Principle C incorrectly predicts that (24c) receives no interpretation at all. Since *every student* does not refer, the coreference reading is excluded in the first place. But (24c) is grammatical, and it means that for every student x, for every student y, x criticized y. To represent this reading at LF, a representation like (25b') must be generated. This requires, however, that both occurrences of *every student* be contra-indexed at some point of the derivation of (25b'). The problem with this contra-indexing lies in the fact that it lacks independent motivation. In fact, it is refutable in that both occurrences of *every student* have the same denotation, EVERY STUDENT, a function from properties to truth values which sends a property q to truth iff the property STUDENT is a subset of q. Now consider (25c), the LF representation of (24d). In (25c), the trace t_i is not bound by *John*, since the latter fails to c-command the former. Hence, Principle C itself cannot rule out (25c), which is not interpretable. In order to block representations like (25c), we must guarantee that contrary to the free indexing mechanism the binding theory assumes, quantified NPs like *everyone* cannot be coindexed with any referential NPs like *John* at S-Structure. But this is tantamount to saying that their interpretations are independent, which Principle C is intended to account for in terms of structural properties.

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