DEPENDENCY CONSTRAINTS ON BINDING

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This paper considers some interactions between binding and dependency, as in "Skolem dependency." It demonstrates that it is possible to maintain a fairly classical Russellian treatment of quantification together with a uniform treatment of pronouns.

Section 1 provides a perspective on dependency and binding. In the context of a determiner phrase theory similar to that of [Abney 86] or [Kuroda 86], it argues that the heads of binding DP's determine their binding scopes at S-structure, and that determiners behave idiosyncratically in this regard. Sections 2, 3, and 4 discuss constraints that apply to S-structure. Section 2 considers the general phenomenon that [Haik 84] calls "indirect binding," also treated by [Evans 80], [Kamp 81], [Heim 82], and many others. Haik presents indirect binding as a mechanism whereby quantifiers may bind pronouns outside their normal binding scopes. Section 2 argues that indirect binding is more properly viewed as a constraint. Section 3 proposes a constraint on dependent quantifiers. Section 4 discusses strong restrictions on the binding of "distributed" pronouns.

1. Binding and dependency

1.1 Idiosyncratic binding scopes

While it is not essential to the discussion, we adopt a determiner phrase theory along the lines of [Abney 86] and [Kuroda 86]. We thus identify

(1) every teacher that swims

as a determiner phrase headed by the determiner *every*. The complement of *every* in (1) is the noun phrase *teacher that swims*. Following [Abney 86], we take pronouns to be determiners. Tentatively, we say that proper names are DP's with phonologically unrealized heads.

The head of a determiner phrase determines whether it is a "binder," like (1), or a "bindee," like *she*.[1] Among bindee DP's, we consider here only pronouns. In contrast to [Evans 80] and [Haik 84], we maintain that there is only one kind of pronoun and only one kind of pronoun binding. That is, the relationship between *every donkey* and *it* in

(2) Every donkey kicked the man that beat it.

is the same as the relationship between *the donkey* and *it* in

(3) The donkey kicked the man that beat it.

and is the same as the relationship between *a donkey* and *it* in

(4) Every man that owns a donkey beats it.

Moreover, there is no distinction among the occurrences of *it* in (2), (3), and (4). We thus assimilate (pronominal) coreference to binding.

A standard view (found, for example, in [Haik 84]) distinguishes coreference from binding, and posits a uniform syntactic prerequisite for pronoun binding, namely c-command of pronoun by quantifier.[2] Even without considering the "coreference" cases, there is evidence that the scopes in which binder DP's can bind pronouns vary for different DP's, and that it is the head of a binder DP that determines its binding scope. The "coreference" cases considered by themselves also support this view. If binding and coreference are taken as a single phenomenon, it is even more clearly necessary to adopt a position that recognizes idiosyncratic binding scopes.

We note at the outset that binary judgments of acceptability do not provide sufficient information to support a full account of pronoun binding. Our illustrations of idiosyncratic binding scopes will use the determiners *every, three, a, the,* and the phonologically unrealized determiner of proper name DP's. There are many factors that can affect judgments on binding possibilities, some of which are discussed in later sections of this paper.

In most cases, DP's headed by *every* can bind pronouns in their c-command domains. The following examples illustrate possible exceptions:

(5) John gave its former master every donkey.
(6) Every linguist agreed that the perfect theory had been established when (s)he discovered a counterexample.

It is very difficult to get *every donkey* to bind *its* in (5). On a reading of (6) that corresponds to high attachment of its adverbial clause, at least some speakers find that it is difficult to get *every linguist* to bind *(s)he.* Note that (6) does not present the same semantic problem for a distributive binding as

(7) Every donkey agreed that it was strongest.

on a collective reading of *agreed.* The c-command rule for DP's headed by *every* might be saved if (5) and (6) receive revised phrase structure descriptions, such as attachment to CP for the adverbial clause in (6).

[Langacker 69] gives a good approximation for the (intrasentential) binding scope of proper names. His criterion is that proper names precede the pronouns that they bind, or else asymmetrically "command" them, where "B is commanded by A" means "B is dominated by the lowest S-node that dominates A" and "neither A nor B dominates the other."[3]

Langacker in effect proposes the same binding scope for DP's headed by *the.* Such DP's are more fastidious binders than proper names, however. For at least some speakers, it is easier to get *John* to bind *he* in

(8) That he succeeded pleased John.

than it is to get *the man* to bind *he* in

(9) That he succeeded pleased the man.

As an approximation, DP's headed by *three* can bind pronouns that they precede. C-command is not necessary. In

(10) If three donkeys escaped, they are returning to their homes.

three donkeys can bind *they* and *their.* (See the discussion of distribution in Section 1.4.)

As an approximation, DP's headed by *a* can also bind pronouns that they precede. C-command is not necessary. In

(11) If John owns a donkey, he beats it.

a donkey can bind *it*. Note that DP's headed by *some* apparently do not have the same binding scopes as DP's headed by *a*. For at least some speakers, it is less acceptable for *some donkey* to bind *its* in

(12) While John was feeding some donkey, Bill was cleaning its stall.

than it is for *a donkey* to bind *its* in

(13) While John was feeding a donkey, Bill was cleaning its stall.

1.2 Skolem dependency

Consider the reading of

(14) Every man loves some woman.

where *every man* has higher "scope" than *some woman,* so that there need not be one woman that every man loves.

(15) $(\forall x)(\exists y)(\text{man}(x) \supset (\text{woman}(y) \mathbin{\&} \text{love}(x,y)))$

is an approximate translation of this reading into predicate logic. According to this reading, there is in effect a function that takes a man and maps it to a woman that the man loves. The reading can thus be represented as

(16) $\text{man}(x) \supset (\text{woman}(f(x)) \mathbin{\&} \text{love}(x,f(x)))$

This illustrates the concept of Skolem dependency. f in (16) is called a "Skolem function." It captures the dependence, for the reading in question, of the choice of woman on the choice of man. For this reading of (14), *some woman* may be called a "dependent" of *every man,* and *every man* may be called a "sponsor" of *some woman.*

The predicate logic example

(17) $(\exists x)(\forall y)(\exists z)(\forall w)(\exists v)P(x,y,z,w,v)$

offers a slightly more complex illustration of Skolem dependency. This corresponds to the following expression with Skolem functions:

(18) $P(c,y,f(y),w,g(y,w))$

c in (18) is called a "Skolem constant." The choice of instantiation for x does not depend on the choice of instantiation for any other variable. The choice of instantiation for z depends on the choice of instantiation for $y,$ and the choice of instantiation for v depends on the choices of instantiation for both y and $w.$

Consider next the predicate logic example

(19) $(\forall x)(\exists y)(P(x) \mathbin{\&} Q(y))$

In standard predicate logic, this is equivalent to

(20) $((\forall x)P(x))\ \&\ ((\exists y)Q(y))$

and thus corresponds to

(21) $P(x)\ \&\ Q(c)$

Although the existential quantifier in (19) is syntactically in the scope of a universal quantifier, there is no dependence, because there is no occurrence of a predicate for which both the variables in question are arguments (or nested arguments). y has nothing to do with x. The logical transformation from (19) to (20) may be called "quantifier lowering." Note that (19) also corresponds to

(22) $P(x)\ \&\ Q(f(x))$

f can map every element of its domain to c. However, Skolemized expressions in which dependencies are minimized, such as (21), clearly convey more information than expressions in which dependencies are not minimized.[4]

There is evidence that only intrinsic Skolem dependencies (corresponding to Skolem functions without dummy arguments) are relevant for analyses of natural language. In

(23) Every teacher that knows every student that owns a computer is content.

a computer is in a syntactic position that allows it to depend on both *every teacher* and *every student,* but there is no apparent dependence on *every teacher.* This reflects the fact that (a variable bound by) *a computer* is an argument of *owns,* as is (a variable bound by) *every student,* while *owns* has no argument corresponding to *every teacher.* In effect, after quantifier lowering, *a computer* is outside the scope of *every teacher,* and this is confirmed by speakers' intuitions on (23). In

(24) Every teacher that knows every student that gave her a computer is content.

on the other hand, *gave* has arguments corresponding to *every teacher, every student,* and *a computer. A computer* intrinsically depends on *every teacher,* as well as on *every student,* and intuitions reflect this.

The syntactic domain in which a DP can depend on a second DP does not in general coincide with the binding scope of the second DP. *Three donkeys* can bind *them* in

(25) If John owns three donkeys, he beats them.

but *two horses* cannot depend on *three donkeys* in

(26) If John owns three donkeys, he beats two horses.

Dependency scopes for preferred readings are of course more restrictive than dependency scopes for possible readings. For at least some determiners, for sponsor DP's headed by those determiners, a precede-and-c-command condition seems to reasonably approximate dependency scope for preferred readings. For example, it is difficult to get *some woman* to depend on *every man* in

(27) That every man succeeded pleased some woman.

On the preferred reading of

(14) Every man loves some woman.

some woman depends on *every man.*

1.3 Relative dependency

Relative clauses can explicitly introduce dependencies. In

(28) Every man loves the woman that admires him.

there is in effect a function that takes a man and maps it to a woman that admires the man. *The woman that admires him* intrinsically depends on *every man.* Note that apparent relative dependencies need not be intrinsic.

(29) Every man loves every woman that admires him.

corresponds approximately to

(30) $(\forall x)(\forall y)((\text{man}(x) \ \& \ \text{woman}(y) \ \& \ \text{admires}(y,x)) \supset \text{love}(x,y))$

Note further that DP's do not depend on binder DP's that they contain. Thus *every man that owns a computer* does not depend on *a computer* in

(31) Every man that owns a computer uses it.

Scopes for relative dependencies derive directly from binding scopes.

Dependence is a transitive relation. On a reading of

(32) Every woman gave some man the book that he requested.

some man binds *he* so that *the book that he requested* depends on *some man,* and *some man* depends on *every woman. The book that he requested* thus depends on *every woman.*

Note finally that there may be mutual dependence between binder DP's, as in

(33) The pilot that shot at it hit the Mig that chased him.

The pilot that shot at it depends on *the Mig that chased him,* and viceversa. The following example is painfully contrived, but may illustrate dependence of each of three DP's on the other two:

(34) The man that had previously offered it to her gave the woman that recently requested it from him a copy of the book that acknowledged his debt to her.

1.4 Distribution

It is not the purpose of this paper to delve into semantic theory. However, it is necessary for the discussion in Section 4 below to say something about the contrast between the pronoun bindings in

(28) Every man loves the woman that admires him.

and

(35) Every man loves the woman that admires them.

When *every man* binds *him* in (28), we say that *him* is "distributed."[5]

An imprecise description of the notion of distribution can rely on an imprecise notion of instantiation. Instantiations of (28) might correspond (very roughly) to *John loves the woman that admires John, Bill loves the woman that admires Bill,* and so on, while instantiations of (35) might correspond (very roughly) to *John loves the woman that admires John and Bill and ... and Fred, Bill loves the woman that admires John and Bill and ... and Fred,* and so on.[6]

Entailment relations between sentences with binder DP's and their instantiations vary depending on the heads of the DP's. For example, sentences that contain (high scope) DP's headed by *every* entail instantiations with respect to those DP's. Sentences that contain (high scope) DP's headed by *some* are entailed by instantiations with respect to those DP's.

We say that a pronoun (binding) in a sentence is "distributed" if an instantiation of the sentence (with respect to the pronoun's binder) replaces the pronoun with an individual constant of the same type as members of the domain of quantification, and if (such) an instantiation of the sentence does not entail the sentence. Thus *him* in (28) is distributed, while *them* in (35) is not distributed. *Him* in

(36) A man loves the woman that admires him.

is not distributed, because *(John is a man and) John loves the woman that admires John* entails (36).[7]

Pronouns may be ambiguous between distributed and non-distributed readings, as *them* is in

(37) Two men love the women who admire them.

In one case, an instantiation of (37) might correspond to *John loves the woman that admires John.*[8] In the other case, an instantiation might correspond to *John loves the women that admire John and Bill.*

In sentences with multiple quantifiers, where there are no branching quantifiers or mutual dependencies, instantiations begin with sponsors and proceed to dependents. For example,

(38) Every man loves two women who admire the children that imitate them.

can be instantiated in three stages, producing (for one reading) instantiations like *John loves two women who admire the children that imitate them, John loves Mary who admires the child that imitates Mary,* and *John loves Mary who admires Pat* on successive stages. Direct and indirect binders of distributed pronouns may be called "distributors." Thus on a reading of

(39) Every man loves a woman who thinks that she is content.

where *a woman* depends on *every man* and *a woman* binds *she, a woman* is a distributor.

Every man and *two women* are "sources of distribution" for the intended reading of (38). Roughly speaking, sources of distribution are DP's that multiply instantiations. A DP that depends on a source of distribution may itself be called "distributed." On the intended reading of (38), *two women* and *the children that imitate them* are distributed. Thus *two women* is both distributed (as a dependent of *every man)* and a source of distribution.[9]

2. The Indirect Binding Constraint

[Haik 84] introduced the term "indirect binding." Similar concepts are developed in [Kamp 81], [Heim 82], and elsewhere. The archetypical illustration of indirect binding is

(4) Every man that owns a donkey beats it.

In this example, *a donkey* directly binds *it,* while *every man* indirectly binds *it.*

We adopt the following definition:

(I) If DP_1 is dependent on DP_2 and binds DP_3, then DP_2 indirectly binds DP_3.

Note that for [Haik 84], c-command (of direct binder by indirect binder) is a prerequisite for indirect binding. Our definition has no such overt syntactic condition.

[Haik 84] presents indirect binding as a mechanism whereby quantifiers may bind pronouns outside their normal binding scopes. For Haik, the binding scopes of *every man* and *a donkey* in (4) are their respective c-command domains. *It* is thus in the binding scope of *every man,* but is not in the binding scope of *a donkey.* Haik claims that pronoun binding is possible if the pronoun is in the binding scope of the candidate direct binder or of a candidate indirect binder. Thus *a donkey* can bind *it* in (4) because *every man* indirectly binds and c-commands *it.*

We propose instead the following constraint:

(II) A pronoun can be indirectly bound by a DP only if it lies within the binding scope of the DP.

This "Indirect Binding Constraint" has some intuitive appeal. It states in effect that the syntactic prerequisite for indirect binding is the same as for direct binding, namely inclusion in binding scope.[10] Beyond its intuitive merits, this constraint accounts for a wider range of phenomena than does Haik's treatment of indirect binding.

Motivation of the Indirect Binding Constraint requires recognition of idiosyncratic binding scopes. In (4), *it* lies within the binding scopes of both *every man,* which c-commands *it,* and *a donkey,* which precedes *it,* so that (4) does not violate the Indirect Binding Constraint and the desired binding can occur. Consider

(40) Every teacher that gave a student a computer wants it back.
(41) Every teacher that gave every student a computer wants it back.

On a reading of (40) where *a computer* depends on *every teacher, a computer* can bind *it.* However, on a reading of (41) where *a computer* depends on both *every teacher* and *every student, a computer* cannot bind *it.* On the desired reading of (40), *a computer* directly binds *it* and *every teacher* indirectly binds *it.* As a DP headed by *a, a computer* includes *it* in its binding scope, as does *every teacher,* which c-commands *it.* On the desired reading of (41), *every student* indirectly binds *it.* However, *every student* does not c-command *it. It* is therefore not in the binding scope of *every student,* and the Indirect Binding Constraint rules out the specified reading. Note that Haik's treatment of indirect binding as a permissive mechanism predicts that this reading is possible.

Only intrinsic dependencies (corresponding to Skolem functions with non-dummy arguments, see Section 1.2) are relevant for the Indirect Binding Constraint. In

(42) Every student that admires every teacher that knows the administrator that owns a computer wants to borrow it.

a computer does not depend on *every teacher,* which does not bind any argument of *owns. It* is therefore not indirectly bound by *every teacher,* and (42) does not violate the Indirect Binding Constraint.

(43) Everyone likes the film he saw, and Mary read good reviews of it.

(from [Haik 84]) is a straightforward illustration of the Indirect Binding Constraint. *The film he saw* depends on *everyone,* so that *everyone* indirectly binds *it* on the intended reading of (43). However, *everyone* does not c-command *it,* and this reading is ruled out.

In both

(44) Every man that picked the flower that he saw gave the woman that liked it a gift that pleased her.

and

(45) If every man that picked the flower that he saw gave it to the woman that liked it, she was pleased.

the flower that he saw depends on *every man,* and *the woman that liked it* depends on *the flower that he saw.* By transitivity of dependence, *the woman that liked it* also depends on *every man.* In (44), *her* is in the binding scopes of *the woman that liked it,* its candidate direct binder, and of both its candidate indirect binders, so that the intended binding can occur. In (45), however, *she* is outside the binding scope of the candidate indirect binder *every man,* and the intended binding is ruled out.

In

(46) Every teacher that gave two students a computer wants it back.

it is in the binding scope of the candidate direct binder *a computer* and of the candidate indirect binders *every teacher* and *two students.* Nevertheless, *a computer* cannot bind *it.*[11] A reading of

(47) Two students that bought a computer brought it back.

where *a computer* depends on *two students* is similar. (46) and (47) seem to violate an agreement constraint. Binder DP's with certain heads can only bind plural pronouns, even for distributed readings. *Two* is an example of such a head. *Many* and *most* are additional examples. DP's with these heads cannot indirectly bind singular pronouns. On the other hand, binder DP's with certain other heads can only bind singular pronouns. *A computer* cannot bind *them* in

(48) Two students that bought a computer brought them back.

Note, however, that in

(49) Two students that bought computers brought them back.

computers can bind *them* and depend on *two students.*

A very small informal survey has revealed that at least some speakers find significant differences in acceptability among the following examples:

(33) The pilot that shot at it hit the Mig that chased him.
(50) The pilot that shot at it hit a Mig that chased him.
(51) The pilot that shot at it hit every Mig that chased him.

All three examples involve mutual dependence between main subject and main object. In (50), *it* lies outside the binding scope of its candidate direct binder *a Mig that chased him,* accounting (in part) for its unacceptability. Similarly, in (51), *it* lies outside the binding scope of *every Mig that chased him.* Because binder DP's headed by *a* tolerate this violation better than do binder DP's headed by *every,* (50) is more acceptable than (51). (33) involves no similar violation, and is more acceptable than either (50) or (51). However, it is less than fully acceptable to at least some people on first encounter. Section 4 includes a discussion of why this is so.[12]

3. The Dependent Subject Constraint

It is more difficult to get a reading of

(52) Some woman loves every man.

where *some woman* depends on *every man,* than it is to get a reading of

(53) Every woman loves some man.

where *some man* does not depend on *every woman.* This reflects the "Dependent Subject Constraint":

(III) (first approximation) A subject may not depend on another determiner phrase.

This is a weak constraint, in the sense that violations lead to unacceptability of a relatively mild nature. Note that (III) does not concern binding.

(54) Every donkey that a man beat is sore.

is an additional illustration of this constraint. *A man* in (54) is a dependent subject. (54) is less acceptable than

(55) Every donkey that kicked a man is contrite.

Examples like the following seem to indicate that (III) is not correct as it stands:

(56) Every man forced a donkey to swim.
(57) Every man guaranteed that a donkey would contribute its labor.

In (56), *a donkey* can depend unproblematically on *every man*. (III) might be revised to refer to case, with "subject" replaced by "nominative DP." The dependence of *a donkey* on *every man* in (57) is more acceptable than the dependence of *a man* on *every donkey* in (54). This might reflect some property of propositional attitudes.

4. Pronoun binding by distributed dependents

Distributed dependents bind pronouns acceptably only when circumstances are ideal. Constraints are intensified when they involve pronoun binding by distributed dependents. This section will illustrate this point with the "Direct Binding Constraint" and the Dependent Subject Constraint.

Compare

(58) Every man that owns it beats a donkey.
(59) The man that owns it beats a donkey.

and

(60) The man that owns it beats a donkey that displeases him.

all read with maximum intrasentential dependencies and bindings. (58) is much less acceptable than either (59) or (60). In all three examples, the DP headed by *a* binds outside its normal binding scope, producing unacceptability. In all three examples, the subject depends on the object, violating the Dependent Subject Constraint. In both (58) and (60), the object depends on the subject. However, in (58), but not in (59) or (60), the DP headed by *a* is distributed. It appears, then, that what might be called the "Direct Binding Constraint" is intensified when the candidate direct binder is a distributed dependent. That is, it is very strongly unacceptable for a distributed dependent to directly bind outside its normal binding scope.

Violations of the Dependent Subject Constraint produce relatively mild unacceptability. It is much more strongly unacceptable for a distributed dependent subject to bind a pronoun. In

(61) Every woman that wrote to a man saw him.

the distributed dependent *a man* in object position binds *him* acceptably. In

(62) Every woman that a man wrote to saw him.

the distributed dependent *a man* is in subject position, violating the Dependent Subject Constraint. It is strongly unacceptable for *a man* to bind *him* in (62). (62) may be contrasted with

(63) A woman that a man wrote to saw him.

where *a man* is not a dependent and where this DP may bind *him* acceptably.

(33) The pilot that shot at it hit the Mig that chased him.

offers a more subtle contrast with (62). *The pilot that shot at it* is a dependent subject, but not a distributed dependent subject. Thus while (33) is somewhat unacceptable, it is not strongly unacceptable for *the pilot that shot at it* to bind *him*. Note that

(64) Some people who a donkey kicked hated it.

(from [Haik 84]) is similar to (62).

5. Conclusion

We have sketched aspects of an account of pronoun binding that does not appeal to pragmatic theory. According to this account, there is only one kind of pronoun and only one kind of pronoun binding. Coreference (of pronouns with non-pronominal overt determiner phrases) is assimilated to binding. The scope in which a determiner phrase can bind pronouns depends on the head of that determiner phrase. Conditions for pronoun binding mix syntactic and semantic criteria. In particular, conditions for pronoun binding refer to dependency and distribution. Conditions for dependency likewise refer to pronoun binding.

This work has progressed in conjunction with work on mechanized language processing. We have been concerned with computing dependencies and bindings in a programming language that conforms to certain natural language universals. During an earlier stage of the work we considered introducing variables as explicit constituents of determiner phrases in a version of LF. Variables would be siblings of determiners, as in [every X $[\text{man}]_{NP}]_{Dbar}$, and would also appear in Spec(N) position for noun phrases with relative clauses, as in [every X [Y [man that loves [her $Y]_{Dbar}]_{Nbar}]_{NP}]_{Dbar}$. American Sign Language uses an analog of explicit variables. However, ASL has no clear analog for the suggested phrase structure analysis. The theoretical support for this analysis is generally quite weak. It is possible to efficiently compute dependencies and bindings without adopting explicit variables. We sketch how to do this for English in a forthcoming paper. Explicit variables may nevertheless be useful in a programming language that is otherwise "naturalized."

Some directions for future work are clear. A thorough and careful treatment of the semantic concepts of dependency and distribution is required, as are a version of LF that makes relationships of binding and dependency transparent, and an account of how this LF relates to other levels of linguistic representation. Our hypotheses should be tested with additional examples from English and other languages. The linguistic literature discusses classes of examples that involve phenomena closely related to the phenomena discussed here. An extended account might cover some of these. A revised account might reveal principles that are simpler than those described here.

Footnotes

[1]We use the term "binding" in a standard way to describe what is primarily a semantic phenomenon. Note that our notion of "binding" does not rely as a matter of definition on syntactic concepts such as c-command. It thus differs from the "binding" of government-binding theory.

[2]We adopt the definition of "c-command" in [Aoun and Sportiche 81]. As [Abney 86] points out, his DP theory eliminates the need to retain the definition in [Reinhart 76].

[3]Quoted material in this sentence is from [Langacker 69]. The sentence itself is a restatement of Langacker's criterion.

[4][Hintikka 74] is a notable example of a linguistics paper that discusses Skolem functions.

[5]The use of the term "distributed" in this context has precedents that go back at least to the Middle Ages.

[6]A serious discussion along these lines requires a more formal treatment. "Correspond" in this sentence need not mean "closely correspond." Note that this kind of simple-minded derivation of instantiations only works for high-scope quantifiers. *If John loves Mary, she is content* does not correspond to an instantiation of *If every man loves Mary, she is content.*

[7]Whether *him* is distributed on a generic reading of (36) is a separate question.

[8]There is an additional ambiguity. An instantiation of (37) might correspond to *John loves the women that admire John.*

[9]We note once again that this material requires a formal treatment, which we defer.

[10]Consider the following imprecise perspective on the Indirect Binding Constraint: if pronouns are replaced with appropriate Skolem objects (variables, Skolem constants, or images of Skolem functions), we have a unified constraint that states every constituent of a Skolem object must lie within the binding scope of the binder that originates the Skolem object. For example, suppose (4) becomes

(fn1) Every man_x that owns a $\text{donkey}_{f(x)}$ beats f(x).

The relevant constituents of *f(x)* are *f*, originating in *a donkey*, and *x*, originating in *every man*. We shall defer the question of whether it is worthwhile to explicitly introduce Skolem objects into linguistic representations.

[11]T. Reinhart proposed (46) in a personal communication.

[12]Examples with purpose infinitives suggest that such infinitives attach to IP, so that they are c-commanded by subjects but not by (for example) objects. In

(fn2) Every man brought a donkey to carry his baggage.

every man can bind *his*. In

(fn3) John beat every donkey to punish it.

however, it is somewhat unacceptable for *every donkey* to bind *it*.

(fn4) Every knight sent a lady roses to impress her.

and

(fn5) John gave every boy a puppy to get rid of it.

are similar examples with indirect binding. In (fn4), *a lady* binds *her* acceptably, but in (fn5) it is somewhat unacceptable for *a puppy* to bind *it*.

(fn6) John sent every boy a picture of a puppy to induce someone to adopt it.

and

(fn7) John sent every boy a picture of a puppy to induce him to buy dog food.

seem to confirm the high attachment of purpose infinitives, but it is apparently contradicted by

(fn8) John sent every boy a picture of a puppy to induce him to adopt it.

where *every boy* can bind *him* while *a puppy* binds *it*. We offer no explanation for (fn8).

Preposed purpose infinitives apparently attach to CP. Thus in

(fn9) To impress the woman that loves him, every knight slew a dragon.

it is difficult to get *every knight* to bind *him*.

(fn10) To impress her, every knight sent a lady roses.

(altered from [Reinhart 85]) is a similar example with indirect binding. If *a lady* depends on *every knight* in (fn10), then *a lady* cannot bind *her*. *Her* is outside the binding scopes of both direct and indirect binder. Some related examples are problematic. For some speakers, *every knight* can bind *her* in

(fn11) To impress her, every knight that loved a lady sent her roses.

and in

(fn12) To impress her, every knight that loved a lady sent that lady roses.

but not in

(fn13) To impress her, every knight that loved a lady slew a dragon.

We offer no explanation for these examples.

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