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THE SCOPE OF INDEFINITES*

This paper claims that indefinite descriptions, singular and plural, have different scope properties than genuine quantifiers. This claim is based on their distinct behavior in island constructions: while indefinites in islands can have intermediate (and maximal) scope readings, quantifiers cannot. Further, the simplest in situ interpretation strategy for indefinites results in incorrect truth conditions for intermediate (and maximal) scope readings. I introduce a mechanism which "automatically" preserves the restriction on free variables corresponding to indefinites, in a way which allows the restriction to be carried up in the course of semantic interpretation and to be used at the level where the variable is quantified. This mechanism is a realization of the "indefinites-as-free-variables" proposal of Lewis, Kamp, and Heim, but emphasizes the role of the restriction. I then show that distributive readings of plural indefinites also display island-escaping behavior and argue for an independent, island-insensitive distribution mechanism.

1. INTRODUCTION

This paper claims that indefinite descriptions, singular and plural, have different scope properties than genuine quantifiers. This claim is based on their distinct behavior in island constructions: while indefinites buried in an island can have intermediate (and maximal) scope readings, quantifiers cannot.

The theory I will suggest works out a semantic mechanism which realizes the potential for deriving differential scope properties implicit in the Lewis-Kamp-Heim idea that indefinites are free variables that get bound by whatever quantifiers are around. My argument is structured as follows: In sections 3 and 4 various island constructions containing indefinites with intermediate scope readings are presented. Models illus-

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trating that the intermediate reading is semantically independent of the maximal and narrow scope ones are introduced. In section 5 I employ Heim's logical forms for quantification to demonstrate that leaving the indefinite in situ results in incorrect truth conditions for intermediate and maximal scope readings. Section 6 tries to pursue the idea of interpreting the content of the restrictive property of an in situ indefinite nonlocally and shows that this does not yield the desired truth conditions.

Sections 7—10 introduce a mechanism which "automatically" preserves the restriction on free variables corresponding to indefinites; the restriction is carried up in the course of semantic interpretation and used at the level where the variable is quantified. This device, which derives differential scope properties for indefinites and quantifiers, exploits the Lewis-Kamp-Heim thesis that indefinites are free variables lacking a quantificational force of their own.

The suggested analysis is further supported by examining plural indefinites, which share scope properties with singular ones. I show that island-escaping distributive readings for plural indefinites are the result of an interaction between the semantics of indefiniteness and an independently motivated grammar of distribution. Finally, I discuss certain semantic approaches in the domains of presupposition, de re interpretation, and focus, and argue that despite formal similarities they should not be united with the proposed semantic interpretation for unquantified indefinites.

2. Fodor and Sag's Argument for the Existence of Referential Indefinites

Fodor and Sag (1982) claim that indefinites are ambiguous between quantificational and referential readings. Their theory is motivated by examples like (1) and (2):

(1) John overheard the rumor that a student of mine had been called before the dean.

(2) John overheard the rumor that each student of mine had been called before the dean.

In (1), the quantificational indefinite *a student* takes narrow scope with respect to the noun complement to yield the narrow scope reading 'John overheard the rumor that some student or other of mine had been called before the dean'. The narrow scope reading of (2) with *each* is derived in the same way. (1) has an additional maximal scope reading, 'John overheard the rumor that a certain student of mine had been called before the dean'. The corresponding maximal scope reading is missing in (2), due (at the descriptive level) to the fact that *each* is a quantifier and cannot escape islands. Fodor and Sag state that a referential indefinite, which does not exhibit scope relations, is responsible for the maximal reading of (1).[1] For them, the closest analogue to a referential indefinite is a demonstrative accompanied by a pointing gesture in the mind of the speaker.

Their argument continues as follows: if the indefinite in (1) were instead a quantifier escaping an island, then (3) and (4) should have an intermediate reading in addition to the other two.

(3) Each teacher overheard the rumor that a student of mine had been called before the dean.

(4) If a student in the syntax class cheats on the exam every professor will be fired.

In this reading *a student* in (3) would be outside the island and inside *each*, yielding 'For each teacher there is a (possibly different) student such that the teacher overheard the rumor that the student had been called before the dean'. The lack of this reading in (3) indicates that no scope relations are involved in deriving the maximal reading. Instead, the referential indefinites in (1), (3) and (4) "shine through" the scope island to give the maximal reading.

King (1988) argues that the intermediate reading is missing in (4), not because quantificational indefinites cannot escape islands as claimed by Fodor and Sag, but because *every* and *each* cannot take wide scope over a conditional. King's restriction is represented in the tripartite structure (4′):

(4′) Will (If a student . . ., <u>every professor</u> . . .)

King attributes the maximal reading of (4) — that which involves a certain student who cheats on the exam — to the possibility of indefinites (unlike *every*-quantifiers) escaping a conditional.

[1] Fodor and Sag note that a richer description of the indefinite (created by a relative clause, an adjective, a possessive phrase, etc.) increases the tendency to understand it referentially. This is so since a lengthy description reveals a certain amount of knowledge on the part of the speaker suggesting his acquaintance with the referent of the description. However, in sections 3 and 4 I also discuss examples of indefinites that lack any further description but take wide scope nevertheless. These data weaken Fodor and Sag's claim that the wide scope reading of an indefinite is a referential one.

However, examples like (5) suggest that King's explanation for the lack of the intermediate reading in (4) cannot be correct.

(5) If John cheats on the exam, every professor might be held responsible.

Sentence (5) is ambiguous between a "Might-Every" and an "Every-Might" reading. The Might-Every reading describes the possibility of all the professors (together) being held responsible. On the Every-Might reading each of the professors individually is at risk of being held responsible. King predicts, incorrectly, that only the Might-Every reading should be available in (5), since in the Every-Might one, *every* takes scope over *might* and consequently escapes the conditional construction.

We will assume here that *might* and *if* together constitute a single construction. With the *might*-conditional expressed in terms of a tripartite structure, the representation of the Every-Might reading of (5) is (5′):

(5′) [every professor]$_i$ might (John cheats on the exam, x_i be held responsible).

So it is not impossible for *every* to take scope out of the nuclear scope in a modal-conditional construction.[2]

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[2] One might object that *if* and *might* constitute a separate operator each; thus in (5) one can give *every* wide scope over *might* but narrower scope than *if*. This leads us to compare (i) and (ii):

(i) If John gets on the committee, every candidate at least might get the job.

(ii) Every candidate is such that he at least might get the job if $\left\{\begin{array}{l}\text{John}\\ \text{a candidate}\end{array}\right\}$ gets on the committee.

(ii) has the same wide scope reading for *every* as (i). This is consistent with the idea that there is just one *might/if* operator. But (iii) also seems to be a paraphrase of (ii): here the syntax indicates that *every* has scope over *might* but not over *if*:

(iii) If John gets on the committee, then it will be the case [that every candidate is such that [he at least might get the job]].

So we cannot dismiss the possibility that there might be a distinct *if* and *might* in (i). But now consider (iv):

(iv) If _ supported by John, every candidate at least might get the job.

Here *if supported by John* has a free variable that wants to be bound by *every candidate*, as in paraphrase (iv′). In (iv″) we have syntactically fixed the scope of *every candidate*, so that this variable is not bound:

(iv′) Every candidate is such that [he at least might get the job if supported by John].

Consider now (6):

(6) If a student cheats on an exam, every professor might institute ethics proceedings.

There certainly is an Every-Might reading with minimal scope for *a student* available here. In analogy to (5′), this reading would have the representation given in (6′):

(6′) [every professor]$_i$ might ([a student]$_k$ [x_k cheats on an exam], x_i institute ethics proceedings)

However, (6) lacks the intermediate reading. Later on we will present examples with indefinites in *if*-clauses which do show intermediate readings.

A final remark before leaving this section. Fodor and Sag claim that examples of VP ellipsis form another piece of evidence for the existence of referential indefinites. But since their data have been convincingly refuted in the literature, I ignore them here.[3]

(iv″) *If supported by John, then it will be the case that [every candidate is such that [he at least might get the job]].

(iv″), unlike (iv′), is ungrammatical. This suggests that (iv) (which is grammatical) has the same logical structure as (iv′), where *every* has maximal scope over the *if*-clause and thus binds the variable inside it. Sentence (iv″), with *every* having maximal scope over *if*, is bad since the *if*-clause contains an unbound variable. The point is that the conclusion that the logical form of (iv) is isomorphic to (iv′) is incompatible with King's proposal that *every* cannot take wide scope over a conditional.

[3] Sag (1976) and Williams (1977) observe that a VP cannot be deleted if its antecedent contains a quantified phrase whose scope is wider than the VP. This accounts for the lack of the wide scope reading of *every* over *someone* in the first sentence of (i):

(i) Someone loves everyone. Chris knows that someone does.

Fodor and Sag (1982) observe that VP deletion can occur in similar configurations involving *a* rather than *every* (e.g. (ii)) and account for this by saying that indefinites may be referential rather than quantificational expressions.

(ii) Everyone hates a man I dated and his wife knows that everyone does.

Hirschbühler (1982) gives examples with *every*-quantifiers which take wide scope over the VP in such configurations (e.g. (iii)), thus questioning Sag's and Williams' empirical claim:

(iii) An American flag flew over every house and a Canadian one did too.

The salient reading of (iii) is the one where there are different flags flying over every house rather than a single gigantic flag flying over all of them. So it seems that VP deletion may occur with either *every* or *a* taking wide scope in the antecedent. Thus at least the VP ellipsis data do not call for the conclusion Fodor and Sag draw about the referentiality of indefinites.

3. Intermediate Readings

While the question of intermediate readings in *if*-clauses seems to be inconclusive at this point, the example King gives of a relative-clause (RC-)island with an intermediate reading constitutes a counterexample to what Fodor and Sag's theory predicts.

(7) Each author in this room despises every publisher who would not publish a book that was deemed pornographic.

Sentence (7) seems to have an intermediate reading in addition to the narrow and wide scope ones, namely the reading where for each author there is a possibly different book satisfying the stated condition. We will argue that this is a genuine intermediate reading, and not some sort of pragmatic narrowing of the narrow scope or maximal scope reading.

To demonstrate that a genuine ambiguity is involved in examples like (7), I will introduce some contextual models showing that the intermediate reading does not entail the narrow one. The narrow scope reading would be entailed if it were the only real reading. But in fact, the readings are independent. Later in this section I will present more island constructions with intermediate readings, and claim that these readings are also independent.

Consider (8):

(8) Every man loves a woman.

According to one view, this sentence is ambiguous between a narrow scope reading for *a woman*, where the choice of woman may depend on the man, and a wide scope reading which asserts that there is a universally loved woman. According to another view, this analysis is problematic since any circumstances which make the wide scope reading true make the narrow scope reading true as well. (That is, the wide scope reading entails the narrow scope one.) The claimed wide scope reading might just result from a pragmatic process of adding information to the narrow scope reading, which would be the only genuine reading. More generally, someone who intuits a wide scope reading might have a hard time explaining what this intuition amounts to. It is not possible to simply point out situations where the wide scope reading is true and the narrow scope reading false.

Does this problem arise in the example we are concerned with? There is a crucial difference between (8) and the intermediate scope reading of (7): in (7) the indefinite is in the restriction of *every*, while in (8) it is in the nuclear scope. Consider (9), a simplified analogue of (7):

(9) Professor Himmel rewarded every student who read *a book* he had recommended.

(9′) Represents the narrow scope reading of the indefinite in (9), and (9″) the wide scope one:

(9′) $\forall s[[\text{student}(s) \wedge \exists b[\text{book}(b) \wedge \text{recommend}(H, b) \wedge \text{read}(s, b)] \rightarrow \text{reward}(H, s)]$

(9″) $\exists b[\text{book}(b) \wedge \text{recommend}(H, b) \wedge \forall s[[\text{student}(s) \wedge \text{read}(s, b)] \rightarrow \text{reward}(H, s)]]$

Let's evaluate (9′, 9″) with respect to the following course of events: Professor Himmel recommended *Buddenbrooks* and *Beowulf* in class. As he is a fan of Thomas Mann, he rewarded every student who read *Buddenbrooks*. Sue read *Beowulf* and was not rewarded. In this case, (9′) is false since there is a student (Sue) who read a book that Professor Himmel recommended (*Beowulf*) but was not rewarded. (9″) is true in this situation since there is a book (*Buddenbrooks*) that was recommended by Professor Himmel and every student who read it was rewarded. Since there is a contextual model in which the wide scope reading is true and the narrow scope one false, the wide scope reading does not entail the narrow scope reading.

Conversely, the narrow scope reading does not entail the wide scope one either. Consider a different model scenario, in which Professor Himmel did not recommend any books at all. In this new model, (9′) turns out to be vacuously true,[4] while (9″) fails on the first two conjuncts.

[4] Ede Zimmerman has pointed out to me that a model resulting in vacuous truth is essential for my argument. Suppose we rule out vacuous truth in (9′), by conjoining the appropriate formula:

(i) $\exists s \exists b[\text{student}(s) \wedge \text{books}(b) \wedge \text{recommended}(H, b) \wedge \text{read}(s, b)] \wedge \forall s[[\text{student}(s) \wedge \exists b[\text{book}(b) \wedge \text{recommended}(H, b) \wedge \text{read}(s, b)] \rightarrow \text{reward}(H, s)]$

Then the model just suggested no longer works and the corresponding version of (9″) is in fact a consequence of (i). If we want to eliminate this problem, we have to change the quantifier, for instance as in (ii):

(ii) Himmel rewarded exactly two students who read a book he had recommended.

(ii′) $2!s[\text{student}(s) \wedge \exists b[\text{book}(b) \wedge \text{recommend}(H, b) \wedge \text{read}(s, b) \wedge \text{reward}(H, s)]]$

(ii″) $\exists b[\text{book}(b) \wedge \text{recommend}(H, b) \wedge 2!s[\text{student}(s) \wedge \text{read}(s, b) \wedge \text{reward}(H, s)]]$

In these formulas, '2!' expresses 'there are exactly two'. In our first model, Professor

We have examined two models so far, one in which the wide scope reading is true and the narrow scope one false, and another where the reverse holds. It is easy to show that the other possible patterns of truth for (9′) and (9″) can also be realized. Both readings are true if Professor Himmel recommends *Beowulf* and every student who read *Beowulf* was rewarded and all students read *Beowulf*. Both are false if Professor Himmel recommended only one book, *Beowulf*, to one student, Sue, who read it and was not rewarded.

We may conclude at this point that the maximal reading in (9) is logically independent of the minimal scope reading. We can make the same claim for (10), where the proper noun phrase *Professor Himmel* is replaced by a quantifier, for the intermediate scope reading relative to the minimal scope one.

(10) Every professor rewarded every student who read a book he had recommended.

To support this claim, we may use the same contextual models as above, except for the additional information that Professor Himmel is the only professor. Since the line of argumentation is the same as before, I will not go through it again; the conclusion is that the intermediate reading in (10) is independent of the narrow one.

Finally, the intermediate reading cannot be a pragmatically induced specialization of the maximal one either, since in the maximal scope reading, the pronoun *he* is not bound, resulting in a clearly independent reading.[5]

Himmel recommended *Buddenbrooks* and *Beowulf* (and nothing else) and rewarded exactly two student readers of *Buddenbrooks* and exactly one student reader of *Beowulf*. Therefore, (ii′) is false and (ii″) is true. Our second model differs only in that he rewarded exactly one student reader of *Buddenbrooks* (instead of two). In this case, (ii′) is true and (ii″) is false.

[5] I discuss the relevant contextual models for these examples at such length because the data on intermediate readings are crucial for the claim I wish to make about the scope of indefinites vs. *every*-quantifiers. Some authors suggest that one reading is a pragmatic strengthening of the other, an explanation I need to rule out. I refer here to Ludlow and Neale (1991), who gave the following examples:

(i) A man in Bermuda thinks that every British detective is after him.

(ii) Every man in Bermuda thinks that a British detective is after him.

Ludlow and Neale say that the correct generalization for generating the narrow, intermediate, and wide scope readings for (i)–(ii) is that a quantifier in a sentence embedded under an attitude verb may not take wider scope than a quantifier not so embedded. Thus the wide scope reading for *every* in (i) with the order *every-a-think* is blocked, but the intermediate reading *a-every-think* is not.

While the indefinite in (9) can be extracted from a RC-island, *every* cannot:

(11) Professor Himmel rewarded every student who read every book he had recommended.

Every book in (11) has only the narrow scope reading, that which gives information only about students who read all the books. (11) lacks the wide scope reading 'Every book is such that Himmel rewarded every student who read it'.[6]

We will refer to Fodor and Sag's quantificational indefinites as "indefinites" and extend this class to include expressions such as *two, several, some, a few*, etc. We contrast them with "*every*-quantifiers" such as *every, each, many, any, few*, and others. For some speakers *every CN* is a NP which denotes a set rather than a quantifier, and thus a referential expression which does not get its wider reading via scoping.[7] To such speakers we suggest replacing all instances of island-bound *every* in our examples with quantifiers such as *almost every, no, exactly five, at most one*, etc.

Let us sum up our discussion of the pair (9, 11) by saying why the data we have observed are unexpected given Fodor and Sag's theory. They point out that there seems to be variation among speakers as to what constructions are scope islands, and instruct readers to reconstruct their

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Ludlow and Neale claim that in (ii) the intermediate reading for the indefinite with the order *every-a-think* is fine; but so is the wide scope reading *a-every-think*. Since the indefinite in the embedded clause of (ii) seems to take wider scope than *every*, contrary to their generalization, they assume the wide scope reading for *a detective* is a pragmatic strengthening of the intermediate reading. The pragmatic strengthening reflects the assumption that there is one detective for every man in Bermuda, rather than a possibly different one.

This perhaps shows that in attitude contexts no scope differences between *a* and *every* can be demonstrated. But since attitude contexts are rather weak islands, we would not have been able to base a very compelling argument on them anyway. We saw above that RC-islands display different scope behavior for *a* and *every*. Unlike the situation in the attitude examples, *every* cannot escape an RC-island to get maximal or intermediate scope. As far as indefinites are concerned, our discussion of models indicated that the intermediate and maximal scope readings of indefinites in RC-islands are independent of each other, and that the intermediate reading is weaker than the maximal one. Thus Ludlow and Neale's strategy cannot be extended to the examples on which I base my argument.

[6] But for *most*, when stressed, the wide scope reading seems available, as indicated by the following dialogue:

(i) A: Himmel rewarded every student who read his monograph on John Barth.

B: Big deal. He rewarded everyone who read $\left\{\begin{array}{c}\textit{most}\text{ books.}\\ ??\textit{every}\text{ book.}\end{array}\right\}$

[7] Such wide scope distributive readings are analyzed in Section 11.

argument using constructions which are strong scope islands for them. Thus the fact that (9) has a distinct intermediate scope reading for many speakers is not in itself problematic; it merely indicates that relative clauses are not scope islands for these speakers. Once we draw this conclusion, though, we expect to find the same kind of variation in scope behavior for *every*, an expectation which is not fulfilled.

4. More Indefinites in Islands

Indefinites may also escape from islands to yield intermediate readings in the following constructions:

(12) Each choreographer believes that it would be damaging for a dancer of his to quit the company.

(13) At most four committee members resisted a proposal that a candidate be turned down.

Besides the narrow scope reading, (12), with its extraposed sentential subject, has the intermediate reading where *a dancer* is evaluated outside *believe* and inside *each*. This configuration yields 'For each choreographer there is a (possibly different) dancer such that he believes it would be damaging for her to quit the company'. The maximal reading may also be possible, namely when *his* takes its antecedent from outside the sentence. But when the indefinite in (12) is replaced by *almost every dancer*, only the narrow scope reading remains available.[8]

The intermediate reading of the noun complement sentence (13) can be paraphrased 'For at most four committee members there is a candidate x such that the member resisted a proposal that x be turned down'. This allows different candidates for different committee members. Again, the indefinite can be extracted from the complement of the sentence-embedding NP *a proposal*.

In the donkey sentences (14) and (15) below, the generic reading is an intermediate one. Rooth (to appear) mentions examples of this kind in the context of a focus-based theory of generic readings. The point relevant to us is that to produce the intermediate reading for these sentences, the indefinite must move out of the RC-island.

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[8] This attitude example, which has an extraposed sentential subject, yields different judgments than Ludlow and Neale's examples discussed in fn. 5.

While this paper was in proof, I received from E. G. Ruys a copy of his dissertation (Ruys 1992), which argues for intermediate readings with data similar to mine. I have not had time to review his analysis in any serious way.

(14) When everybody an agent works with trusts him, he is usually a traitor.

(15) Rarely does every critic who reviews a book by Henry Miller like it.

In (14) the indefinite *an agent* in the RC-island (which is part of the restrictor) takes wider scope than *everybody* (which is also part of the restrictor) and is quantified by the adverb of quantification *usually*. Descriptively, this is an intermediate scope reading, since a maximal scope reading would involve discourse-level existential force for *an agent*. The generic reading represented in (14′) is 'Most agents who are trusted by everyone they work with are traitors'.

(14′) $$\text{Usually}_x(\underbrace{\text{agent}(x) \wedge \forall y[\text{work-with}(x, y) \rightarrow \text{trust}(y, x)]}_{\text{restrictor}}, \underbrace{\text{traitor}(x))}_{\text{nuclear scope}}$$

Sentence (15) can be paraphrased as 'Few books by Henry Miller are liked by every critic who reviews them'. To permit the generic reading of (15), *a book* must escape the RC-island and take wider scope than *every critic*, so that it can be quantified by *rarely*. The indefinite ends up in the restrictor of *rarely* and the universal quantifier in the nuclear scope:

(15′) $$\text{Rarely}_x(\underbrace{\text{book}(x) \wedge \text{by}\,(\text{Henry Miller}, x)}_{\text{restrictor}}, \underbrace{\forall y[[\text{critic}(y) \wedge \text{review}(y, x)] \rightarrow \text{like}(y, x)])}_{\text{nuclear scope}}$$

Readings of (14) and (15) where the indefinite takes maximal or minimal scope relative to the two other quantifiers are less obvious.[9]

[9] When the indefinite in (14) takes wide scope, the adverb of quantification has nothing to bind except a time variable. This gives a somehow less salient reading of a certain agent who is usually a traitor. The indefinite cannot take narrow scope since it must have scope at the level of the adverb of quantification in order to allow *he* to be bound. Similarly for (15).

Unlike the indefinites in (14) and (15) *every*-quantifiers cannot get intermediate readings in such examples, as (16) shows:

(16) Everybody $\left\{\begin{array}{l}\text{at most one agent}\\ \text{few}\end{array}\right\}$ works with trusts him.

The last island examples we will review are adverbial clauses from which indefinites, but not quantifiers, may be extracted. This is illustrated by the following conversation:

(17) A: John is a total neurotic. He got so worked up when Chomsky gave a talk.

B: Big deal. *Everybody* got nervous when *some speaker* talked.

Some speaker in B's response may have wider scope than *when* and narrower scope than *everybody*, especially when both quantifiers are stressed. Notice the contrast with (17′) where *almost every* cannot get wider scope even when stressed:[10]

(17′) B: *Somebody* got nervous when *almost every speaker* talked.

This is presumably so because *when*-clauses are islands from which quantifiers cannot escape.

The intermediate reading is also available in the examples below:

(18) Every gambler will be surprised if one horse wins.

(19) Every purported miracle attributed to Moses would have been less impressive if a now uncontroversial scientific theory had been known at the time.

(20) Every one of them moved to Stuttgart because a woman lived there.

Since the narrow scope reading in (18) is pragmatically strange (because it suggests a contrast with two or more horses winning), the intermediate reading is the salient one. On this reading, there might be a specific horse for each gambler that he has bet on, and the gambler would be surprised if his horse wins. On this interpretation, *one horse* has wider scope than *if* and narrower scope than *every*.[11] Again, *every* cannot be extracted from

[10] The data seem to be quite inconsistent here. B's response in (17′) seems better with *every*.

[11] Notice that the intermediate reading is much harder to get if we replace *one horse* with *a horse* in (18). But it is perhaps still relatively natural with *some*.

the *if*-clause even when stressed, as (21) shows:

(21) A: John got so worked up because White Star won the race.

B: Big deal. John would be excited if *every horse* had won.

If it could, B's response in (21) would imply that John would be surprised if Blacky were *the sole* winner; but it does not seem to imply this. The only reading it has (if we replace *big deal* by *I disagree*) is the narrow scope one in which all horses must win to make John surprised.

(19) is similar to (18) in that the contextually strange narrow scope reading makes room for the intermediate one. This is so since each miracle referred to in (19) is expected to be explained by a certain relevant scientific theory rather than by any scientific theory whatever. Along the same lines, *a woman* in (20) can take intermediate scope and escape the *because*-clause which, like *if*, blocks extraction of *every*.

The availability of intermediate readings with indefinites in islands becomes evident when contrasting such examples with *there*-insertion sentences. Milsark (1974) has observed that *there*-insertion sentences lack a wide scope reading for the NP after *be*. Imagine that (22) and (23) spell out some university regulations:

(22) There must be someone in the building at 7 A.M.

(23) Someone must be in the building at 7 A.M.

The *there*-insertion sentence has only the narrow scope reading for *someone* relative to *must*: 'It is required that there be someone or other in the building at 7 A.M.' (23) has the additional wide scope reading 'There is someone who is required to be in the building at 7 A.M.'.

According to Heim (1987), if *someone* in (22) were to take wider scope than *there*, it would bind a variable at the level of *there*. But since a variable is strong, it cannot occupy this position; this accounts for the lack of the wide scope reading in (22).

Let us now compare (24) and (25):

(24) Every professor got a headache whenever there was a student he hated in class.

(25) Every professor got a headache whenever a student he hated was in class.

We have strong intuitions about the contrast of intermediate readings in (24) and (25). The following situation highlights this contrast:

Professor Himmel hates Sue.
Sue was in class on September 14 at 2.00 P.M.
Professor Himmel did not get a headache on September 14.

Professor Himmel hates Sheila.
Sheila was not in class on September 14.
Whenever Sheila was in class, Professor Himmel got a headache.

Our intuition is that the proposition expressed by (24) is false in this situation, since Sue was in class and Professor Himmel did not get a headache. This is predicted by the thesis that only the narrow scope reading is available for (24), given the restriction on extracting indefinites from *there*-insertion sentences. (25), on the other hand, does have a reading that can be true in the above situation, namely the reading that there is a student, Sheila, such that when she is in class, Himmel gets a headache. On this reading of (25) the indefinite escapes the island; therefore it must be an intermediate reading. If (25) had only the narrow scope reading and got the apparent intermediate reading by a pragmatic process, what then would explain the contrast with (24)?

In this paper I will put aside referential indefinites and the question whether they exist independently of quantificational ones. Instead I will concentrate on indefinites which are clearly quantificational by Fodor and Sag's criteria. Whether Fodor and Sag's theory of referential indefinites is correct or not, we have seen that indefinites and *every*-quantifiers display different scope properties in intermediate readings. Since Foder and Sag maintain that indefinites with intermediate scope are quantificational, their thesis cannot explain why the scope behavior of these indefinites is different from that of genuine quantifiers. The aim of sections 7—10 below is to propose a theory which accounts for this difference.

The claim that indefinites display different scope properties than *every*-quantifiers should not come as a surprise, since a distinction between the two underlies Heim's and Kamp's theory of NP quantification and the work which evolved around it. What I attempt to explain here is how this distinction is responsible for their non-uniform behavior in islands.

5. HEIM'S NP-PREFIXING AND QUANTIFIER CONSTRUAL

In this section I survey briefly how tripartite structures with *every* and *a* are derived in Heim's theory (Heim 1982), since I shall argue in terms of these logical forms in the following sections. For Heim, indefinites gain quantificational force by being indexed to quantifiers, in particular inserted existential quantifiers. A rule called Existential Closure, which consists of two subrules, is responsible for the existential reading of indefinites. The first subrule adjoins an existential quantifier to the nuclear scope of every quantifier. For instance, the indefinite *a cat* in (26) receives an existential reading since an existential quantifier is adjoined to the nuclear scope and coindexed with *a cat*. This is represented in (26′):

(26) Every man saw a cat.

(26′) $[\text{every}[_{NP}\ \text{man}]_1\ [\exists_2[[_{NP}\ \text{a cat}]_2\ [_S\ e_1\ \text{saw}\ e_2]]]]$

The second subrule applies to a sequence of sentences $S_1, \ldots, S_n$, deriving existential readings for maximal scope indefinites by adjoining an existential quantifier to a discourse node whose daughters are $S_1, \ldots, S_n$.

Heim's Existential Closure covers all cases of existential readings of indefinites. Its formulation has the virtue of not generating existential readings for donkey sentences like (27):

(27) Every man who owns a donkey is rich.

Since *a donkey* is part of a RC which is in the restrictor of the tripartite structure of (27), it cannot be bound by existential closure of the nuclear scope. Thus, the existential quantifier adjoined to the nuclear scope has nothing to bind, as its lack of index in (27′) indicates:

(27′) $[\text{every}\underbrace{[_{NP}\ \text{man who}_1\ [_S\ [\text{a donkey}]_2\ e_1\ \text{owns}\ e_2]]}_{\text{restrictor}}\ [\exists\underbrace{[_S\ e_1\ \text{is rich}]]}_{\text{nucl. scope}}$

Sentence (28) is a similar case of vacuous quantification where the existential quantifier binds nothing in the nuclear scope:

(28) Every man arrived.

(28′) $[\text{every}[_{NP}\ \text{man}]_2\ [\exists[_S\ e_2\ \text{arrived}]]$

Heim's derivation of tripartite LFs for *every* involves two steps: (i) NP-Prefixing and (ii) Quantifier Construal. NP-Prefixing adjoins every non-pronominal NP to S, leaving behind a coindexed empty NP, as illustrated in (29′). The same rule is applied to indefinites, as illustrated in (30′).

(29) Every man arrived.

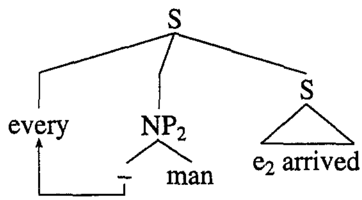
(30) A man arrived.

(29′) $[_S\ [\text{every man}_2]\ [_S\ e_2\ \text{arrived}]]$

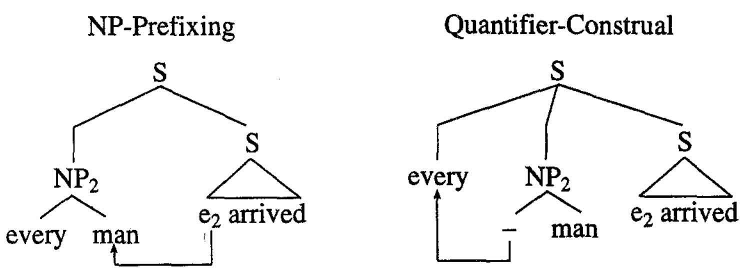
(30′) $[_S\ [\text{a man}]_2\ [_S\ e_2\ \text{arrived}]]$

Quantifier Construal attaches a quantificational determiner (a quantifier in Heim's terminology) as the leftmost immediate constituent to S:

(29″)

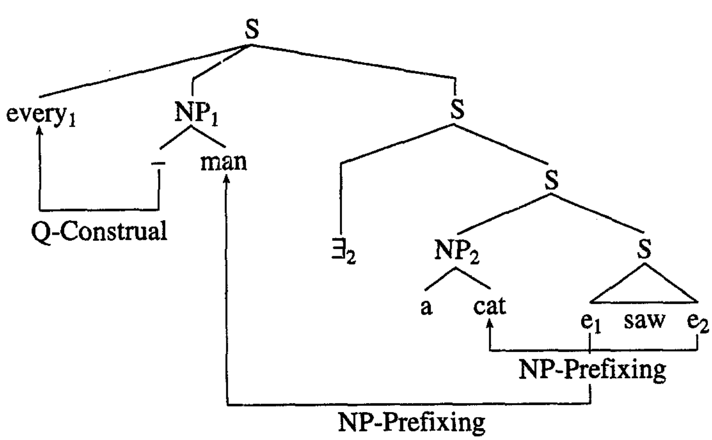


While NP-Prefixing operates on both *every*-quantifiers and indefinites, Quantifier Construal applies only to *every*-quantifiers, including adverbial, temporal, and modal operators. The application of the two rules yields the tripartite structures [Q, R, S], where Q is a quantifier and R either an NP (as in (29″)) or a S (when Q is an adverb of quantification). The two rules are exemplified below:



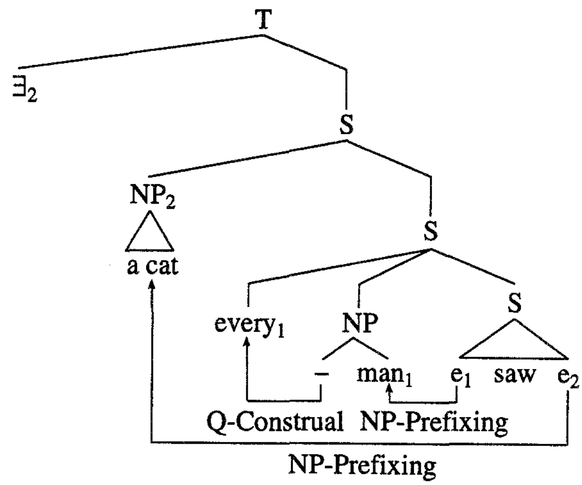
For Heim, NP-Prefixing nondeterministically fixes the scope of quantification. The narrow scope reading of (26) is represented in (26″):

(26″)



In the wide scope reading represented in (26‴), the indefinite NP is prefixed to a higher position next to an existential quantifier dominated by a discourse node:

(26‴)



Thus, scope ambiguities result from multiple options in applying NP-Prefixing. Quantifier Construal, on the other hand, is a deterministic process which supports semantic interpretation.

In both (26″) and (26‴) the indefinite is bound by the lowest c-commanding quantifier. This is a consequence of an indexing rule which copies the referential index of an indefinite NP onto the lowest c-commanding quantifier.[12]

How should the intermediate reading for the indefinite in example (18), repeated here, be derived via Heim's rules?

(18) Every gambler will be surprised if one horse wins.

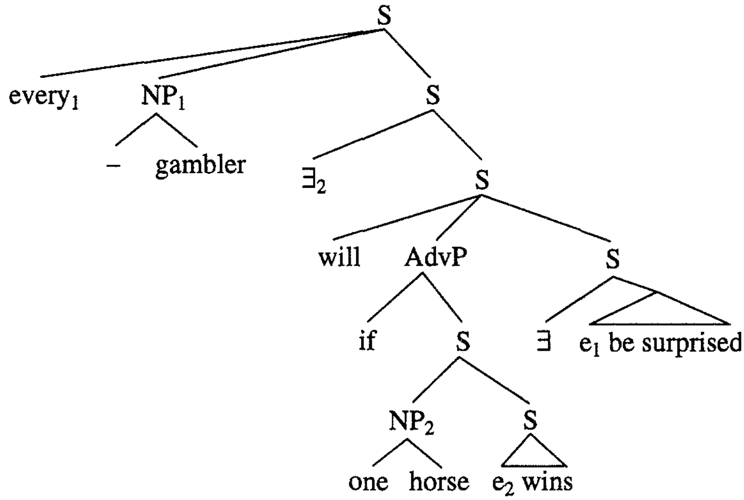
To permit the intermediate reading the existential quantifier must have narrower scope than *every* but wider scope than the modal/conditional expressed by *will* and *if*:

(18′) $\forall x(\text{gambler}(x), \exists y \text{ will } (\text{horse}(y) \wedge \text{win}(y), \text{surprised}(x)))$

Note that in (18′), the *if*-clause is serving as the restrictor of *will*. We thus have represented (18) by inverting the order of the *if*-clause and its corresponding main clause in LF.

[12] When the quantifier *every* is moved out of the NP by Quantifier Construal, it takes with it the referential index. This is how *every* and *man* in (26″) are assigned the same index.

(18″)



(18″) depicts the attempt to obtain the intermediate reading by indexing *one horse* to the existential closure operator adjoined to the scope of *every*. However, (18″) does not represent the intermediate reading of (18). (18″) has the following weak truth condition: for every gambler x, there is a y such that for every accessible future world w such that [y is a horse in w and y wins in w], [x is surprised in w]. The first bracketed clause is the restrictor for the world quantifier and the second is the nuclear scope. The first conjunct in the restrictor can be made false, and the formula as a whole made vacuously true, by choosing a y which is not a horse in w. For instance, if George Bush is not a horse in any of the worlds w that the quantification expressed by *will* ranges over, the implication is vacuously true.[13] To get the desired intermediate reading, *one horse* must be extracted from the island.

Notice that (18″) violates Heim's quantifier indexing, since $\exists_2$ is not the lowest quantifier c-commanding the indefinite. The lowest quantifier c-commanding *one horse* is the modal/conditional operator *will*.

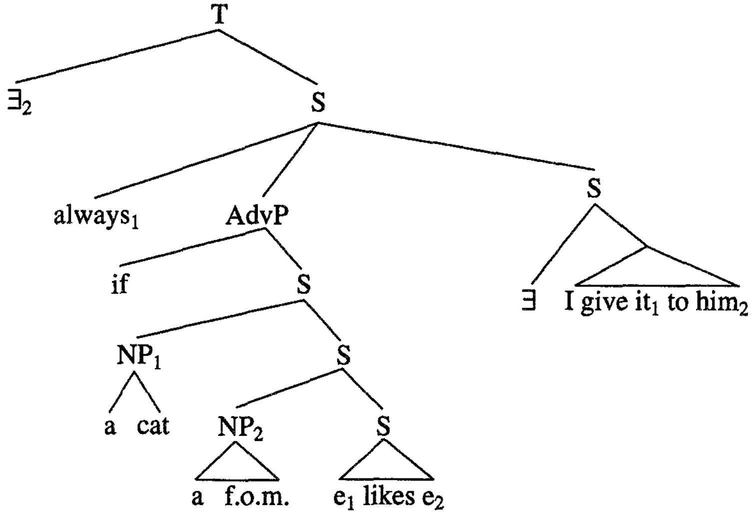
[13] This assumes a semantics for the conditional that allows for vacuous truth. As Steve Berman has pointed out to me, it would be reasonable to suppose that a conditional presupposes that its restriction can be made true. Thus (18″) would give rise to a presupposition failure, which still would not be equivalent to an intermediate reading. Conceivably, however, one might say that an intermediate reading is obtained by accommodating a presupposition that x_2 is a horse in w_0 at the intermediate level. I return to the possibility of a presuppositional theory in Section 12.1.

A similar example is discussed by Heim:

(31) If a cat likes a friend of mine I always give it to him.

Heim concentrates on the less preferred reading of (31), where *a friend of mine* takes maximal scope, namely 'There is a friend of mine such that if a cat likes him, I always give it to him'. To produce this reading, the existential quantifier binding a *friend of mine* must have wider scope than *always*, as shown in (31′).

(31′)



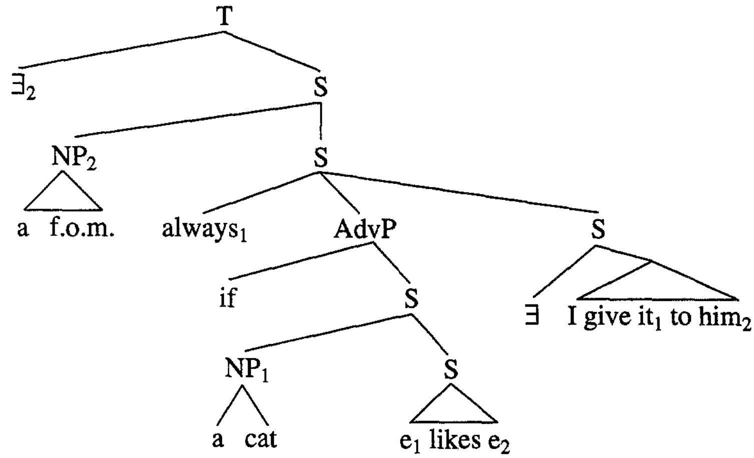
In this configuration, *always* is a quantifier in a lower position than $\exists_2$ which c-commands the indefinite *a friend of mine*. The interpretation of this configuration produces the wrong truth conditions for (31):

(31″) $\exists x_2 \forall x_1 [\text{cat}(x_1) \wedge \text{f.o.m.}(x_2) \wedge \text{like}(x_1, x_2) \rightarrow \text{give}(I, x_1, x_2)]$

This is so since (31″) is verified by the existence of something that is not a friend of mine.

Heim correlates this weak interpretation, which is not the intended reading of (31) (where *a friend of mine* takes wide scope), with the violation of quantifier indexing. To avoid this she suggests moving the indefinite to the level of the discourse existential closure quantifier, as in (31‴):

(31‴)



Unfortunately, while moving the indefinite out of the *if*-clause gives (31) the right wide scope reading, it violates an island constraint.[14]

[14] The same difficulty encountered here with regard to indefinites shows up in the case of *wh*-phrases. Reinhart (1991) discussed the following examples:

(i) Who will be offended if we invite which philosopher?

(ii) Who adores everyone who understands which philosopher?

She claims, correctly, that the variable in (i)–(ii) cannot be bound in situ by the Q-operator. If the index of *which philosopher* is bound to Q and the restrictive N remains in situ, we get the logical representation in (i′):

(i′) Q ⟨x, y⟩(we invite y and y is a philosopher) → (x will be offended)

But since anything which is the value of y and is not a philosopher makes (i′) true, it cannot be the intended interpretation of (i), as demonstrated by the inappropriate answer (iii):

(iii) Lucie will be insulted if we invite Donald Duck.

To get the right reading the restrictive N must be pulled out of the implication:

(i″) Q⟨x, y⟩ (y is a philosopher) ∧ (we invite y → x will be offended)

Leaving the restrictive N in (i) in situ raises the same problem of incorrect truth conditions that we discussed with respect to the intermediate reading of example (18) and Heim's example (31). And, just as moving the restrictive N to the right position results in an island violation, moving the *which*-phrase at LF gives an unbound anaphor, as noted by Reinhart:

(iv) Who remembers which patient$_1$ had war-hero fantasies about himself$_1$?

(iv′) [What fantasies about himself$_1$ who [e remembers which patient$_1$ e had e]]

Another example given by Reinhart, one which combines the problems in (i) and (iv), shows that *which*-N in situ must move at LF but cannot:

(v) Who remembers which lady will be offended if we invite which of her philosophical rivals?

6. First Alternative: Nonlocal Determination of the Content of the Restrictive Property

The above discussion of examples with intermediate readings and of Heim's (31) shows that not only the existential quantifier but also the restrictive property associated with the indefinite should be interpreted nonlocally. Two different kinds of nonlocality can be identified: (i) nonlocal determination of the content of the restrictive property and (ii) nonlocal use of this property in semantic composition. In this section we concentrate on the first possibility.

Enç (1986) proposes that the temporal reference of nouns can be determined nonlocally. She argues that examples like (32) illustrate the empirical inadequacy of the analysis of tense as a sentential operator.

(32) Every fugitive is now in jail.

Since (32) has present tense, the NP is evaluated with respect to the utterance time whether it is in the scope of the tense or outside it. The sentential analysis, therefore, predicts only the contradictory reading involving individuals who are fugitives now. However, as Enç observes, sentence (32) also has a noncontradictory reading involving individuals who were fugitives and are now in jail. Although (32) has no past tense, the subject seems to be interpreted at a past time on this reading. Enç concludes that nouns as well as verbs are provided with temporal arguments. Whereas the temporal argument of a verb is the syntactic tense, the temporal argument of a NP is not overtly represented in the syntax and is semantically indexical, according to Enç. In this sense the temporal reference of nouns is interpreted nonlocally — the denotation of the temporal argument depends on context rather than on structural configuration.

Let's try to generalize the idea of nonlocal interpretation of a restrictive property to the modal reference of nouns. This amounts to saying that where the descriptive content of a noun is evaluated is not structurally determined. Take for instance examples (33) and (34):

(33) Things would be different if **every senator** had grown up to be a rancher instead.

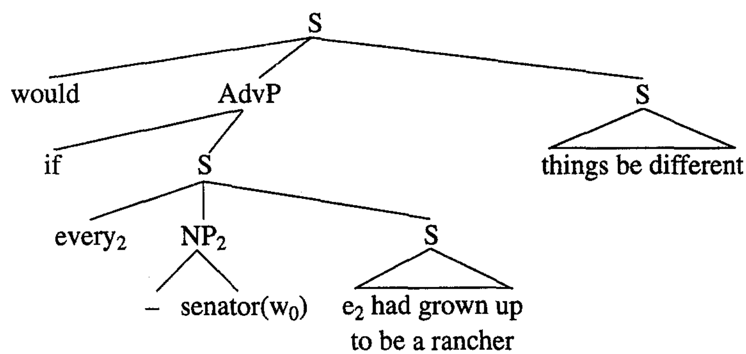
To solve this dilemma Reinhart introduces a choice function which selects a member of the set denoted by the restrictive noun. This enables the restrictive noun to remain in situ and yields the desired interpretation for (i) by picking a specific individual from the set of philosophers of whom the implication in (i′) should be true.

(34) Things would be different if **a senator** had grown up to be a rancher instead.

The content of *senator* in (33) and (34) is determined nonlocally, since we are considering senators in the base world rather than in the non-base one. Note, however, that *every* is still understod as having narrow scope: (33) contemplates situations in which all of the senators of our world are ranchers instead. Example (34), where *every* is replaced by *a*, has both narrow and wide scope readings.

Does recognizing the possible nonlocal determination of the content of nouns give us an explanation for the difference in intermediate readings between *every* and *a*? Let's look at (33′), which represents the narrow scope reading of (33):

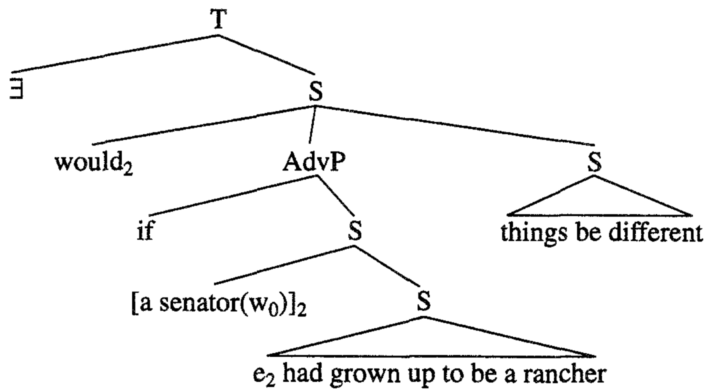
(33′)



The representation in (33′) has two quantifiers, *would* and *every*; each is part of a corresponding tripartite structure, [would AdvP S] and [every NP S] respectively. The tree in (33′) illustrates the possibility of nonlocal determination of the content of nouns. It does so by representing the base world w_0 as an implicit argument of *senator*. What is crucial to us in (33′) is that while the restrictive property *senator* is evaluated in the base world, it enters interpretation inside the *if*-clause, since this is the position of *every* at LF. This analysis, where *senator* gets its content in the actual world and enters interpretation inside the *if*-clause, yields the correct truth conditions for (33): for every maximally close world w such that for every x [x is a senator in w_0 $\rightarrow$ x is a rancher in w], [things are different in w].

In the narrow scope reading of (34), the content of *senator* is also determined nonlocally: things would be different if any of our senators had grown up to be a rancher instead. This would have a representation along the following lines:

(34′)

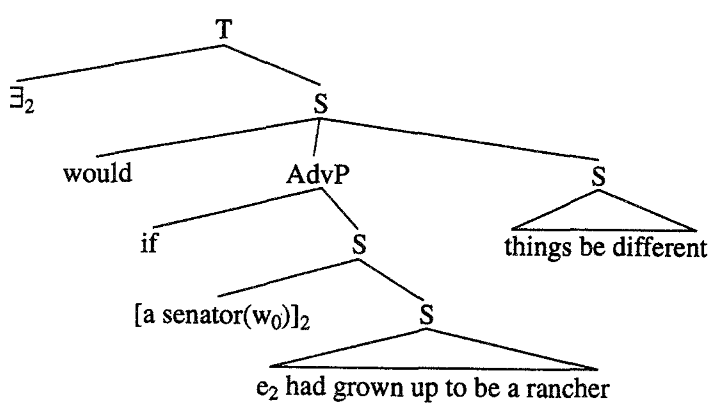


In this case, the indefinite is indexed to its local c-commanding operator *would*, thereby gaining something like universal force. However, as in (33), the content of the noun is still evaluated in the base world, as indicated by the representation 'senator(w_0).'

This configuration yields the desired interpretation for (34) with minimal scope for *a senator*: for every maximally close world w such that for some x [x is a senator in w_0 and x is a rancher in w], [things are different in w].

How would we arrive at the wide scope reading of (34)? Suppose we drop Heim's constraint that indexing of indefinites is local and allow a representation as in (34″):

(34″)



The indefinite a *senator* is indexed nonlocally to the discourse existential closure operator. Independently, *senator* obtains its content in the base world w_0. Does this yield the correct maximal scope reading for (34)? If the answer is positive, we have at hand a motivated explanation for the different intermediate readings of *a* and *every* in all our previous examples from sections 3 and 4. This would amount to the claim that intermediate readings occur when determination of NP content and existential closure take place independently at the same intermediate level. Specifically, the noun *senator* in (34″) gets interpreted outside the *if*-clause without moving syntactically by being evaluated at the base world. Independent of this mechanism, the existential quantifier is generated and indexed at the same level. Similarly, for intermediate readings like (18), *one horse* would be interpreted in the base world outside the *if*-clause at the level where the existential quantifier is generated. This analysis of intermediate readings is attractive since the semantic analysis of the noun is independently motivated.

Unfortunately, it is not clear that this approach solves the problem of trival truth conditions discussed above. Suppose we represent the function-argument structure of (34″) as follows:

(34‴) $\exists x\ \text{would}_w(\text{in}\ (w_0, \text{senator}(x)) \wedge (\text{in}\ (w, \text{rancher}(x)), \text{in}(w, \text{things are different}))$

If this in turn is understood as 'There is an x such that for every maximally close world w such that x is a senator in w_0 and x is a rancher in w, [things are different in w]', then it seems we would obtain unacceptably weak truth conditions, because anything that is not a senator in w_0 would serve as an x making the formula true. For such an x, there is no world satisfying the condition on w in which '*in* $(w_0, senator(x))$' is a conjunct.

There is a second problem with the nonlocal determination of the content of a restrictive property in semantic interpretation as an approach to intermediate readings. Sentence (35a) and our earlier example (10), repeated below, indicate that intermediate readings are not limited to modal or intensional contexts:

(35) a. (In every town) every girl that a boy was in love with married an Albanian.

b. (In every town) every girl that every boy was in love with married an Albanian.

(10) Every professor rewarded every student who read a book he had recommended.

(35a) has an intermediate reading; (35b), the variant with *every*, does not. This intermediate reading is represented in (35′):

(35′) $\forall t\,[\mathrm{town}(t) \rightarrow \exists x[\mathrm{boy}(x) \wedge \mathrm{in}(x,t) \wedge \forall z(\mathrm{girl}(z) \wedge \mathrm{love}(x,z)$
$\wedge\ \exists a[\mathrm{Albanian}(a) \wedge \mathrm{marry}(z,a)]]]$

Since this example is extensional, there is no issue of different modal contexts determining the content of *boy*. The same is true of (10). This means that even if the strategy outlined above could somehow be made to work for intensional cases, nonlocal determination of the content of restrictive properties could not be the general source of intermediate readings.

7. Diagnosis of the Problem

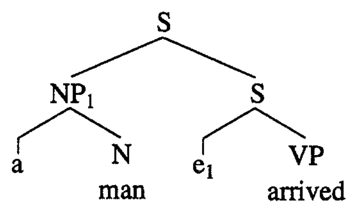
I have argued that indefinite descriptions have different scope properties than genuine quantifiers: they can escape islands. This is in line with the distinction in semantic type between indefinite descriptions and quantifiers drawn in Kamp (1981) and Heim (1982). We saw that existing formalizations do not immediately predict differential sensitivity to islands. In Heim's theory, indefinites are scoped just like quantifiers. As observed by her and shown in section 5 above, indexing indefinites while leaving them in situ gives the wrong truth conditions, assuming the obvious way of composing meanings. In Section 6 we extended Heim's argument, showing that this remained a problem even given a mechanism for fixing the content of restricting properties nonlocally. Since indexed in situ indefinites do not behave in the desired way, Heim proposed scoping indefinites at LF to the level where they are quantified. But once syntactic scoping is acknowledged, sensitivity to islands is predicted.

In the theory originally proposed by Lewis, Kamp and Heim, indefinites lack a quantificational force of their own and are like variables in the sense that they get bound by whatever quantifiers there are around. Following the slogan which has been attached to that theory, "indefinites are free variables," the intuition is that this should predict different scope properties. In standard logics free variables are automatically preserved when expressions are combined until they become bound by a variable-binding operator. This process does not involve a noncompositional mechanism such as quantifier scoping. It is simply a consequence of the semantics of variables.

We want to arrive at a semantic mechanism which somehow realizes the potential of the "indefinites-as-variables" idea. The source of our problem is the assumption that the restrictive property of an in situ indefinite becomes a conjunct in the interpretation of the phrase in which it immediately occurs. More specifically, (36a) below can be interpreted by rule (36c), which conjoins the restricting formula with the material coming from the S node, thus deriving (36b).[15]

(36) a. A man_1 arrived.

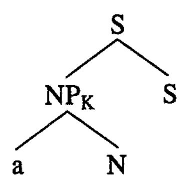
b. Tree:



Interpretation:

$\text{man}(x_1) \wedge \text{arrive}(x_1)$.

c. Configuration:



Interpretation:

$N'(x_k) \wedge S'$

However, we saw that this rule often gives incorrect interpretations. Rule (36c) has two aspects, and the problem arises with the second one: (i) the rule introduces a free variable corresponding to the indefinite, which will automatically be carried up in later stages of the semantic derivation; and (ii) it conjoins the restriction of the indefinite with material coming from the S node.

To avoid the incorrect interpretation created by (ii), we would like a semantic mechanism which "automatically" preserves the restrictions on free variables corresponding to indefinites, instead of conjoining them at the level of an in situ indefinite. These restrictions should then enter interpretation in the normal sense only at the level where the variable is quantified.

8. A Semantics for Unquantified Indefinites

According to the idea sketched in the previous section, the semantics of a phrase containing an unquantified indefinite should preserve the restriction on that indefinite in a way which allows it to be automatically carried up in

[15] The configuration should actually be interpreted by a pair of rules, one for $[_{NP}\ \textit{an}\ N]$ and one for [NP S]. These have been collapsed in (36b).

the course of semantic interpretation. I will employ a straightforward realization of this idea.

Independent of the problem having to do with the restricting property, it is desirable to semantically distinguish the interpretation of phrases with pronouns or definite descriptions from those of phrases containing indefinites. By this I mean that the semantics should reflect the fact that (36a) contains an unquantified indefinite, instead of a definite as in (37).[16]

(37) The man_1 arrived.

According to the variable theory, the interpretation of (36) and (37) would be '*arrive*(x_1)', ignoring the restrictive property. We now need some way to express that (36) but not (37) contains a free indefinite. We can represent this in a semantic metalanguage with a set of unquantified variables corresponding to the free indefinites:

(36′) $\text{arrive}(x_1)\!:\!\{x_1\}$

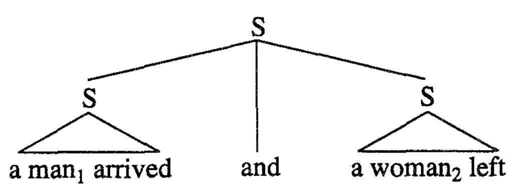
(37′) $\text{arrive}(x_1)\!:\!\{\ \}$

In terms of the structure of the semantic interpretation system, the set U in the notation 'ϕ : U' functions as a set of indices of unquantified in situ indefinites. I will call these sets 'U-sets.'

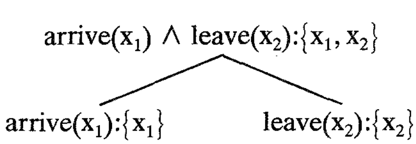
In line with the program sketched out above, the elements of U-sets should be carried up by standard interpretation rules. That is, the U-set for a mother node is the union of the U-sets of its daughters. Consider for instance sentence conjunction:

(38) a. A man arrived and a woman left.

b. Syntax:



c. Semantics:



[16] Heim's File Change Semantics and related approaches make semantic distinctions between indefinites and definites. In Heim's theory, the distinction is based on a presupposition of novelty for the index of an indefinite.

In the semantic tree, x_1 and x_2 are carried up to the U-set of the mother node. However, the representation above ignores the restriction of the formulas. In interpretations of the form '$\phi : U$', restrictive properties should be incorporated into the U-sets, rather than into ϕ. We therefore modify the system so that each element of U is a pair consisting of a variable and a restriction. The representations of (36a) and (37) are now (36″) and (37″), respectively:

(36″) $\text{arrive}(x_1)\text{:}\{\langle x_1, \text{man}(x_1)\rangle\}$

(37″) $\text{arrive}(x_1)\text{:}\{\ \}$

The semantic representation of (38) is now (38′):

(38′)
$$\text{arrive}(x_1) \wedge \text{leave}(x_2) : \begin{Bmatrix} \langle x_1, \text{man}(x_1)\rangle \\ \langle x_2, \text{woman}(x_2)\rangle \end{Bmatrix}$$
$$\text{arrive}(x_1) : \{\langle x_1, \text{man}(x_1)\rangle\} \qquad \text{leave}(x_2) : \{\langle x_2, \text{woman}(x_2\rangle\}$$

The derivation above can be described in a systematic way using compositional semantic rules like those of Montague Grammar. We shall use the definition below, where $1(\phi : U)$ selects the formula ϕ while $2(\phi : U)$ selects its U-set, U.

$$1(\phi : U) = \phi$$

$$2(\phi : U) = U$$

The simple conjunction rule (36c) conjoins the left parts of (38′) and applies Union to the right parts:

Syntax | Standard semantics:

S

S_1' and S_2' | $S_1' \wedge S_2'$

Semantics taking U-sets into account:

$$1(S_1') \wedge 1(S_2')\text{:}2(S_1) \cup 2(S_2)$$

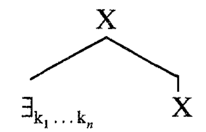
This gives the top formula of (38′), repeated here:

$$\text{arrive}(x_1) \wedge \text{leave}(x_2) : \begin{Bmatrix} \langle x_1, \text{man}(x_1)\rangle \\ \langle x_2, \text{woman}(x_2)\rangle \end{Bmatrix}$$

9. Variable Binding Rules

Unlike ordinary semantic rules, which automatically pass up the unbounded variables in U-sets, variable binding rules should remove the variables they bind from U-sets. In addition, they should specify what to do with the restrictive formulas which are included in these sets. In order to keep as much as possible unchanged compared to Heim's original approach, I will adopt her logical forms, except for the modification having to do with the syntactic position of indefinites. Below is the syntactic configuration Heim assumes for the unselective existential closure operator:

(39)



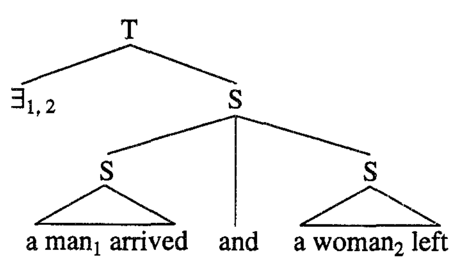
The semantic rule for this configuration should simply bind the n variables existentially, conjoining the restrictions on those variables with the interpretation of the phrase X, which in typical cases is S. In addition, the quantified variables should be removed from the U-set. All of this is spelled out in the rule below:

(39′) *Existential Closure Rule*

Where $\langle x_{k_1}, \phi_1 \rangle, \ldots, \langle x_{k_n}, \phi_n \rangle \in 2(X')$, the interpretation is:
$\exists x_{k_1} \ldots \exists x_{k_n} [\phi_1 \wedge \ldots \wedge \phi_n \wedge 1(X')] : 2(X') - \{\langle x_{k_1}, \phi_1 \rangle, \ldots, \langle x_{k_n}, \phi_n \rangle\}$

Note that the quantified variables are required to be present in the U-set of the input interpretation X′. This has the effect of ruling out vacuous quantification semantically. (If this effect is not desired, the obvious default could be added. I do not know of any considerations bearing on this.)

We now can apply our Existential Closure Rule to example (38a) from the previous section, setting $k_1 = 1$, $k_2 = 2$, and $\phi_1 = \text{man}(x_1)$, $\phi_2 = \text{woman}(x_2)$, and assuming essentially the same syntax as was given in (38b) above:



The semantics is as follows:

$$X' = \text{arrive}(x_1) \wedge \text{leave}(x_2) : \begin{Bmatrix} \langle x_1, \text{man}(x_1)\rangle \\ \langle x_2, \text{woman}(x_2)\rangle \end{Bmatrix}$$

$$1(X') = \text{arrive}(x_1) \wedge \text{leave}(x_2)$$

$$2(X') = \begin{Bmatrix} \langle x_1, \text{man}(x_1)\rangle \\ \langle x_2, \text{woman}(x_2)\rangle \end{Bmatrix}$$

$\langle x_{k_1}, \phi_1\rangle \ldots \langle x_{k_n}, \phi_n\rangle \in 2(X')$, since

$$\langle x_1, \text{man}(x_1)\rangle, \langle x_2, \text{woman}(x_2)\rangle \in \begin{Bmatrix} \langle x_1, \text{man}(x_1)\rangle \\ \langle x_2, \text{woman}(x_2)\rangle \end{Bmatrix}$$

Applying the Existential Closure Rule (39′) now, we derive the following:

$$\exists x_1 \exists x_2[\text{man}(x_1) \wedge \text{woman}(x_2) \wedge \text{arrive}(x_1) \wedge \text{leave}(x_2)]:$$

$$\left(\begin{Bmatrix} \langle x_1, \text{man}(x_1)\rangle \\ \langle x_2, \text{woman}(x_2)\rangle \end{Bmatrix} - \begin{Bmatrix} \langle x_1, \text{man}(x_1)\rangle \\ \langle x_2, \text{woman}(x_2)\rangle \end{Bmatrix}\right) =$$

$$\exists x_1 \exists x_2[\text{man}(x_1) \wedge \text{woman}(x_2) \wedge \text{arrive}(x_1) \wedge \text{leave}(x_2)] : \{\ \}$$

We see that in the final step, the two variables are quantified and their restrictions become conjuncts at the level of the existential quantification.

In order to illustrate island-escaping behavior, we need to consider a more complicated configuration, such as a relative clause. In example (40) below (which sounds complicated but is semantically simple, since it does not involve intensional operators), we are concerned with a reading where *a cat* has intermediate scope.

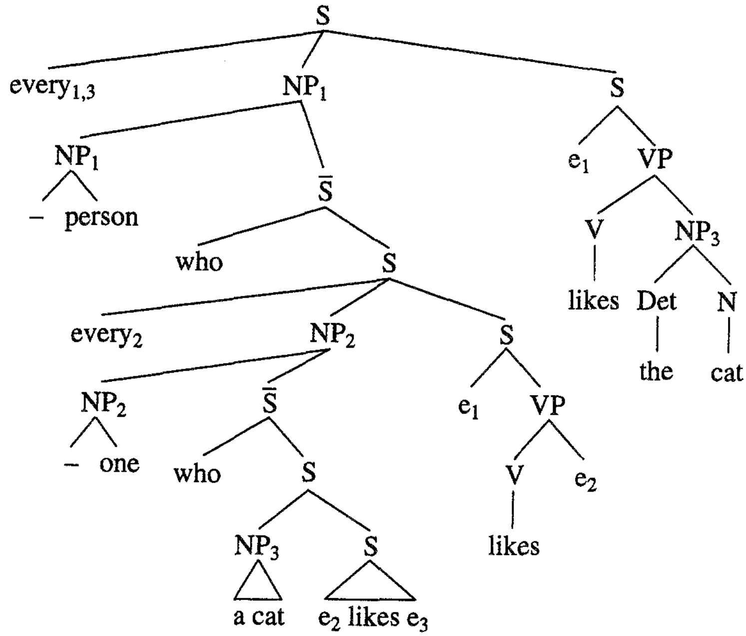
(40) Every person who likes everyone who likes a cat likes the cat.

This reading can be paraphrased by 'For every person x, if x has the following property: there is a cat x_3 such that x likes every x_2 who likes x_3, then x likes x_3'.

I argued above that, since the surface position of *a cat* is in a relative clause, we do not want to say that it gets this scope by means of the quantifier scope mechanism. Instead, we assume an LF configuration where the indefinite is still in an embedded position:[17]

[17] In this representation, I assume a symmetric treatment of the variables with indices 1

(40′)



The indefinite is not strictly speaking in situ, since I assume (following Heim) that it has been adjoined at LF to a dominating node, here the lowest S-node dominating its surface position. This choice is not at all necessary; it simply has the virtue of preserving as many as possible of

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and 3. While this is the assumption made in Heim's and Kamp's original work on donkey sentences, it has subsequently been criticized for causing the so-called 'proportion' or 'farmer-donkey asymmetry' problem. Chierchia (1992) addresses this problem by proposing representations in which a nominal quantifier quantifies directly only the variable corresponding to its head. Variables corresponding to indefinites in the restrictor (such as the index 3 in (40′)) are (dynamically) existentially quantified instead. In order to incorporate Chierchia's proposal, I would need to assume a representation along the following lines:

(i) [every$_1$ [$\exists_3$[. . . [a cat$_3$] . . .] [e$_1$ likes the cat$_3$]]]

The quantifier $\exists_3$ is a dynamic existential quantifier which, given Chierchia's semantics, binds the variable 3 in the scope. My conclusions regarding island-escaping behavior are unaffected, since in the above representation the coindexing of $\exists_3$ and [*a cat*]$_3$ bridges the RC-island. Incorporating Chierchia's proposal would account for the following example, suggested to me by Manfred Krifka, where the intuited truth conditions clearly involve counting people, not person-cat pairs.

(ii) Most people who like everyone who likes a cat like the cat.

However, an unpleasant aspect of this approach is that it mixes different version of Discourse Representation Theory, the indexing/existential-closure one I have been assuming and the dynamic one employed by Chierchia.

Heim's assumptions, and perhaps it also makes the meaning of the logical forms a bit more transparent. The relevant point is that *a cat* is still inside the RC-island. Its scope is indicated by coindexing with the quantifier *every*. In order to work out the semantics, we need a rule for this quantifier:

(41) *Every-rule*:

Configuration:

$$[_{S}\ \text{every}_{k_1,\ldots,k_n}\ \ \text{NP}\ \ \text{S}]$$

Interpretation:

Where $\langle x_{k_1}, \phi_1\rangle, \ldots, \langle x_{k_n}, \phi_n\rangle \in 2(\text{NP}')$, the interpretation is: $\forall x_{k_1} \ldots \forall x_{k_n}[[\phi_1 \wedge \ldots \wedge \phi_n \wedge 1(\text{NP}')] \rightarrow 1(\text{S}')]) : [[2(\text{NP}') - \{\langle x_{k_1}, \phi_1\rangle, \ldots, \langle x_{k_n}, \phi_n\rangle\}] \cup 2(\text{S}')]$

This rule is quite similar to (39′) above, the rule for the existential closure operator. The restrictions on the quantified variables become conjuncts in the restriction of universal quantification. Notice that the variable associated with the NP headed by *person* is treated on a par with the variable associated with the indefinite. In order to make this work, I assume that the NP [− person] introduces a restricted variable into the U-set, just like an indefinite. With the *Every*-Rule (together with others rules assumed by Heim, such as the conjunctive rule for the relative clause) we can now establish a semantic derivation for (40):[18]

[18] Bottom to top, steps for deriving the top formula in (40″) are as follows:

$1(\text{NP}') = \text{like}(x_2, x_3)$

$$2(\text{NP}') = \begin{Bmatrix} \langle x_2, \text{person}(x_2)\rangle \\ \langle x_3, \text{cat}(x_3)\rangle \end{Bmatrix}$$

$1(\text{S}') = \text{like}(x_1, x_2)$.

$2(\text{S}') = \{\ \}$

$\langle x_{k_1}, \phi_1\rangle, \ldots, \langle x_{k_n}, \phi_n\rangle \in 2(\text{NP}')$ since $\langle x_2, \text{person}(x_2)\rangle, \langle x_3, \text{cat}(x_3) \in$

$$\begin{Bmatrix} \langle x_2, \text{person}(x_2)\rangle \\ \langle x_3, \text{cat}(x_3)\rangle \end{Bmatrix}$$

(40″)

$$\forall x_1 \forall x_3 \left[\left[\begin{matrix} \text{person}(x_1) \wedge \text{cat}(x_3) \wedge \\ \forall x_2[\text{person}(x_2) \wedge \text{like}(x_2, x_3) \rightarrow \text{like}(x_1, x_2)] \end{matrix}\right] \rightarrow \text{like}(x_1, x_3)\right] : \{\ \}$$

$$\forall x_2 \left[\left[\begin{matrix} \text{person}(x_2) \wedge \\ \text{like}(x_2, x_3) \end{matrix}\right] \rightarrow \text{like}(x_1, x_2)\right] : \left\{\begin{matrix} \langle x_1, \text{person}(x_1)\rangle \\ \langle x_3, \text{cat}(x_3)\rangle \end{matrix}\right\} \qquad \text{like}(x_1, x_3) : \{\ \}$$

$$\forall x_2 \left[\left[\begin{matrix} \text{person}(x_2) \wedge \\ \text{like}(x_2, x_3) \end{matrix}\right] \rightarrow \text{like}(x_1, x_2)\right] : \{\langle x_3, \text{cat}(x_3)\rangle\}$$

$$\text{like}(x_1, x_3) : \left\{\begin{matrix} \langle x_2, \text{person}(x_2)\rangle \\ \langle x_3, \text{cat}(x_3)\rangle \end{matrix}\right\} \qquad \text{like}(x_1, x_2) : \{\ \}$$

$$\text{like}(x_2, x_3) : \{\langle x_3, \text{cat}(x_3)\rangle\}$$

The result is the one we want, where the variable restricted by *cat* is quantified by *every*, rather than having existential force at the discourse level. Descriptively, this is an intermediate scope reading.

10. The Scope of Genuine Quantifiers

As already evident in the tree above, the scope of genuine quantifiers such as *every* is represented at LF by movement. The empirical observation

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Application of *Every*-Rule to 'every$_2$':

$$\forall x_2[\text{person}(x_2) \wedge \text{like}(x_2, x_3) \rightarrow \text{like}(x_1, x_2)] : \left\{\begin{matrix} \langle x_2, \text{person}(x_2)\rangle \\ \langle x_3, \text{cat}(x_3)\rangle \end{matrix}\right\}$$
$$- \{\langle x_2, \text{person}(x_2)\rangle\} \cup \{\ \} =$$
$$\forall x_2[\text{person}(x_2) \wedge \text{like}(x_2, x_3) \rightarrow \text{like}(x_1, x_2)] : \{\langle x_3, \text{cat}(x_3)\rangle\}$$

The rule for the RC is conjunctive. It has the effect of adding $\langle x_1, \text{person}(x_1)\rangle$ to the U-set. In the rule, $n = 2$ (i.e., two variables are quantified). $\langle x_1, \phi_1\rangle$ is $\langle x_1, \text{person}(x_1)\rangle$ and $\langle x_2, \phi_2\rangle$ is $\langle x_3, \text{cat}(x_3)\rangle$. Clearly,

$$1(\text{NP}') = \forall x_2[\text{person}(x_2) \wedge \text{like}(x_2, x_3) \rightarrow \text{like}(x_1, x_2)]$$
$$2(\text{NP}') = \left\{\begin{matrix} \langle x_1, \text{person}(x_1)\rangle \\ \langle x_3, \text{cat}(x_3)\rangle \end{matrix}\right\}$$
$$1(\text{S}') = \text{like}(x_1, x_3)$$
$$2(\text{S}') = \{\ \}$$

Applying the *Every*-Rule to 'every$_{1,3}$' we get:

$$\forall x_1 \forall x_3[\text{person}(x_1) \wedge \text{cat}(x_3) \wedge \forall x_2[\text{person}(x_2) \wedge \text{like}(x_2, x_3) \rightarrow \text{like}(x_1, x_2)]$$
$$\rightarrow \text{like}(x_1, x_3)] : \left\{\begin{matrix} \langle x_1, \text{person}(x_1)\rangle \\ \langle x_3, \text{cat}(x_3)\rangle \end{matrix}\right\} - \left\{\begin{matrix} \langle x_1, \text{person}(x_1)\rangle \\ \langle x_3, \text{cat}(x_3)\rangle \end{matrix}\right\} \cup \{\ \} =$$
$$\forall x_1 \forall x_3[\text{person}(x_1) \wedge \text{cat}(x_3) \wedge \forall x_2[\text{person}(x_2) \wedge \text{like}(x_2, x_3) \rightarrow$$
$$\text{like}(x_1, x_2)] \rightarrow \text{like}(x_1, x_3)]$$

that quantifiers cannot escape islands gave rise to theoretical restrictions on movements (such as subjacency) in order to capture quantifier scope islands. My claim that genuine quantifiers undergo movement is consistent with these theoretical restrictions. Indefinites which lack quantificational force of their own can be given scope by indexing, relying on the U-set mechanism to carry up the restrictions on the variables. Such a mechanism would not work for genuine quantifiers, where not only the restriction but also the quantificational determiner must be carried up. Note again that the distinction between indefinites and genuine quantifiers relies on Heim's and Kamp's hypothesis that indefinites do not contribute a quantificational force of their own. Rather, they contribute a variable and (as emphasized in my formulation) a restriction on it.

This way of drawing a distinction between indefinites and genuine quantifiers relates differences in scope behavior to a difference in the source of the quantificational force. The element contributing the quantificational force of an indefinite — the existential quantifier — is freely generated, and related to the indefinite by indexing. The element contributing the quantificational force of a genuine quantifier — the quantification determiner — is generated in the surface position of the quantified NP, and its scope is marked by movement. Notice that this approach relies on a certain syntactically oriented version of Discourse Representation Theory (DRT), that of Chapter 2 of Heim (1982). In versions of DRT using a dynamic semantics — Heim's File Change Semantics and related approaches (e.g. Groenendijk and Stokhof 1991) — one cannot draw the distinction in this way, since in these theories the quantificational (or 'indefinite') force of indefinites originates in the indefinite determiner.[19]

There is an aspect of the treatment of the semantic contribution of

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[19] A *NALS* reviewer suggests the following modification of my theory:

(i) The scope of indefinites is marked at LF by a mechanism other than movement, such as indexing to a null operator.

(ii) Indefinites, together with a semantic encoding of their quantificational force, are stored and retrieved at the level specified by (i).

This would be consistent with a dynamic semantics for indefinites, since indefinite force would originate in the indefinite description. Since this way of proceeding eliminates any reliance on the 'indefinites-as-free-variables' idea, one can, as the reviewer points out, accept that the scopal behavior of indefinites is as I claim, while adopting a dynamic theory of indefinites.

In such an approach, though, the LF indexing of indefinites becomes merely mechanical, in that it stipulates the scope behavior of indefinites without in any way deriving it, and so the contribution of this article would be mainly empirical. I expect that the resolution of this issue will depend on independent lines of evidence bearing on syntactic vs. dynamic formulations of DRT.

[– person] in (40′) proposed above which has potential impact on the logical form of quantification. Since I chose to treat the variable x_1 as a restricted variable present in a U-set, it might be possible in certain cases to leave the restrictions of genuine quantifiers in embedded positions, relying on the U-set mechanism to carry up the semantic information to the level where the variable is quantified. That is, we could say that the scope of NP quantification is determined by the LF position of the quantificational determiner, without assuming (as Heim does) that a quantificational determiner and its source NP are sisters at LF. Since this version of the theory would still assume movement of the determiner, island predictions would presumably not be affected. But since I see no motivation for such a modification, I will not pursue it.

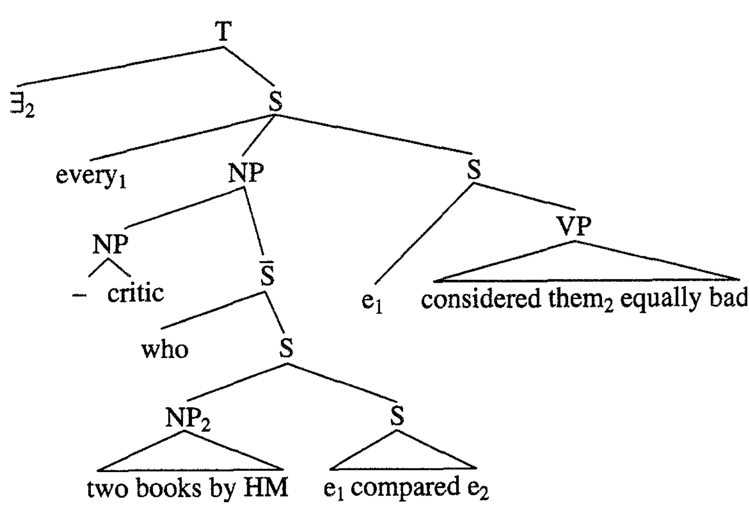
11. Plural NPs

Group readings of plural indefinites have the same properties as singular indefinites. A sentence such as (42), with the verb *compare*, has only a group reading.

(42) Every critic who compared $\left\{\begin{array}{l}\text{two books}\\ \text{several books}\end{array}\right\}$ by Henry Miller considered them equally bad.

The maximal scope reading of (42) is: 'Two particular books by Henry Miller are such that every critic who compared them considered them equally bad'. In this reading the plural NP escapes from the island just as a singular one would. This group reading corresponds to the following LF:

(42′)



Applying our Existential Closure Rule (39′) to (42′) gives us the wide scope reading for the plural indefinite *two books by HM*, as illustrated by the derivation in (42″) below.[20] Just as with singular indefinites, the restrictions *books by HM* and *two*, which are in the U-set of the RC, are carried up to the level where x_2 is quantified. Thus group indefinites, like singular ones, can escape islands by virtue of being variables coindexed with quantifiers in higher positions.

(42″)

$$\exists x_2 \begin{bmatrix} \text{b-by-HM*}(x_2) \wedge \text{two}(x_2) \wedge \\ \forall(x_1)[\text{cr}(x_1) \wedge \text{compare}(x_1, x_2) \rightarrow \text{ceb}(x_1, x_2)] \end{bmatrix}$$

$$\forall x_1 \left[\begin{bmatrix} \text{cr}(x_1) \wedge \\ \text{compare}(x_1, x_2) \end{bmatrix} \text{ceb}(x_1, x_2) \right] : \{\langle x_2, \text{b-by-HM*}(x_2) \wedge \text{two}(x_2) \rangle\}$$

$$\text{compare}(x_1, x_2) : \left\{ \begin{matrix} \langle (x_1)[\text{cr}(x_1)] \rangle \\ \langle x_2, \text{b-by-HM*}(x_2) \wedge \text{two}(x_2) \rangle \end{matrix} \right\} \qquad \text{ceb}(x_1, x_2)$$

$$\text{compare}(x_1, x_2) : \{\langle x_2, \text{b-by-HM*}(x_2) \wedge \text{two}(x_2) \rangle\}$$

Consider (43) now:

(43) Whenever every critic who compares two books by Henry Miller considers them equally bad, they are usually in fact quite good.

Here the group intermediate reading is derived in the same way as the intermediate reading for singular indefinites.

By contrast, distributive readings of plural indefinites seem to involve a potential problem. Since the distribution operator is a universal quantifier ranging over all atomic parts of the group denoted by the NP, we expect distributive readings to have the scope properties of quantifiers, i.e., to be sensitive to scope islands. This is not the case, however. For instance, one of the readings of sentence (44) is a wide scope distributive one, where distribution takes wide scope over *every*:

(44) Every critic who reviewed $\left\{ \begin{matrix} \text{two books} \\ \text{several books} \\ \text{most books} \end{matrix} \right\}$ by Henry Miller panned them.

[20] The notation '*book-by-HM**(x_2)' means that x_2 is a plurality of books by Henry Miller. In my representation and discussion, I am ignoring Link's distinction between sums and groups (Link 1983).

This reading amounts to 'Each of two books is an x such that every critic who reviewed x panned x'. The problem is that in this reading both the plural indefinite *two books* and the distributive operator are extracted from the RC island.

The phenomenon is actually more general and can be illustrated with definite group-denoting NPs as well. (45) has a reading in which the definite plural *them* is distributed at the maximal level:

(45) I am writing a paper about two books by Henry Miller. Every critic who reviewed them panned them.

As before, the wide scope reading of the plural definite is 'Each of them is an x such that every critic who reviewed x panned x'.[21]

This wide scope distributive reading is problematic for Heim, Lasnik, and May's theory of plurality (Heim, Lasnik, and May 1988; henceforth HLM). They proposed that distributive readings are represented at LF with a D-operator adjoined to the group NP.[22] One of the examples they discuss is (46):

(46) They speak two languages.

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[21] Manfred Krifka has suggested to me that this sentence has a third reading, namely 'Every critic who reviewed one or more of them panned the books he or she reviewed', and that the difference to the wide scope distributive reading becomes evident if one substitutes *most* for *every*:

(i) Most critics who reviewed them panned them.

Krifka's reading does not entail that each of the books was panned by most critics who reviewed it; thus it is clearly distinct from my wide scope distributive reading. I feel both readings are possible. The following context brings out the reading entailing that each of the three books was panned by most critics who reviewed it, I think:

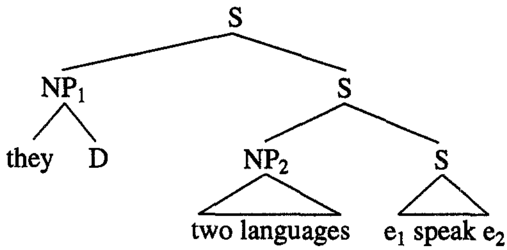
(ii) Those last three books by Henry Miller weren't considered good. Most critics who reviewed them panned them.

On Krifka's reading, which also seems available here, one of the three books could have been favored by a slight majority of critics who reviewed it. Inserting *on the whole* in the introductory context sentence seems to bring it out more strongly. The logical form for this reading might involve an operator with a partitive meaning inside the relative clause, as suggested by the paraphrase 'Most critics who reviewed one or more of them panned the books he or she reviewed'.

[22] HLM make use of the distributive operator to analyze reciprocal sentences. The connection is that a reciprocal sentence like *They like each other* can be paraphrased by 'Each of them likes the other(s) of them', where *each* can be viewed as a distributive operator ranging over a group and binding a variable in a lower position.

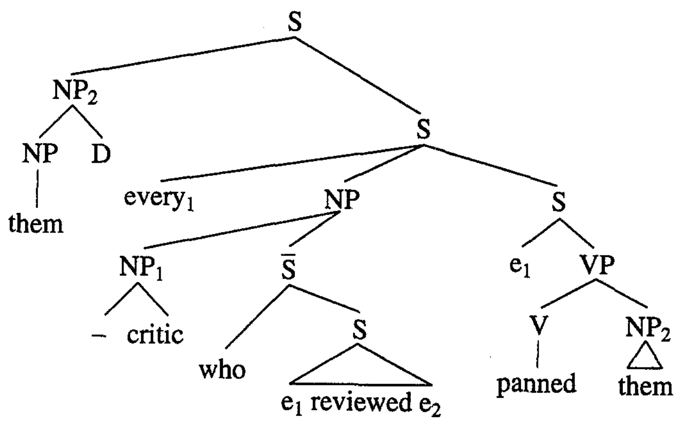
This sentence is analyzed as in (46′), which amounts to the reading 'Each of them speaks two languages'.

(46′)



Thus HLM turn a distributive group NP into a (genuine) quantifier, which we would expect to have the island sensitivity of quantifiers. The second sentence of (45) above, with the wide scope distributive reading, would be given the following analysis:

(45′)



But the distributive operator in the above tree escapes from the RC-island and binds the trace e_2 that has been left behind. In fact, HLM give the following example which they claim demonstrates the island sensitivity of the distributive operator:

(47) The student that John and Mary taught argued that they would win \$100.

They note that (47) lacks the reading 'Each of John and Mary has the property of being an x_2 such that the student that x_2 taught argued that $they_2$ would win \$100'. For this reading to be obtained, both the plural NP and the distributive operator must escape the island.

However, there is an independent factor involved here that blocks this reading in (47). Once we change *the student* in (47) into a dependent plural, the island effect seems to disappear and the missing reading becomes available:

(48) The students that John and Mary taught argued that they would win $100.

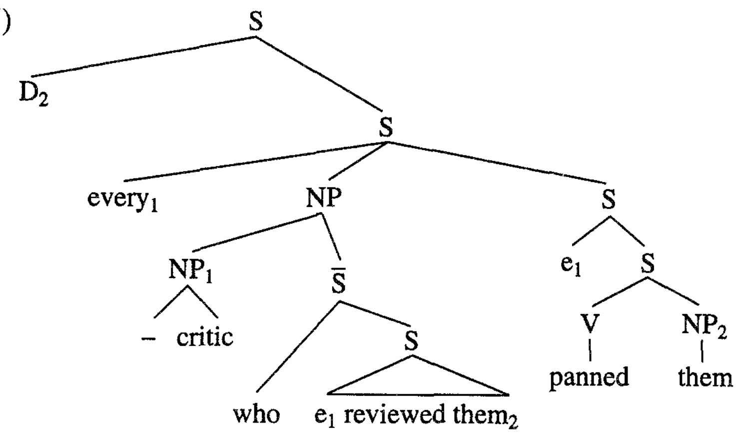
This reading is even more evident in (49):

(49) The assistants that John and Mary hired hoped that they would get a $100,000 grant.

Among other things, this sentence can mean that the assistant John hired hoped John would get a grant and the assistant Mary hired hoped she would get a grant.

These facts are reminiscent of those we observed for indefinites: distribution is insensitive to quantifier scope islands. This suggests a logical form for the second sentence of (45) where the distribution operator, rather than being moved as in (45′) above, is generated in a higher position and indexed to the NP it distributes:

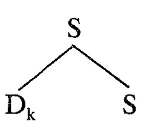
(45″)



Such a representation can be interpreted by the following rule:

(50) *Distribution Rule* (*preliminary version*)

Configuration:



Interpretation

$\forall x_{k.a}[x_{k.a} \in x_k \rightarrow S'[x_{k.a}/x_k]]$
(where $S'[x_{k.a}/x_k]$ is the interpretation of S with $x_{k.a}$ substituted for x_k)

The notation '$x_{k.a} \in x_k$' here is understood as '$x_{k.a}$ is an atomic part of x_k'; thus the quantified variable $x_{k.a}$ ranges over atomic parts of x_k. By virtue of the variable substitution, occurrences of the index k inside the scope of the operator (in (45″) above, the two occurrences of *them*$_2$) refer to the atom rather than the group. (45‴) gives the resulting semantic tree for the second sentence of (45):

(45‴) $\forall x_{2.a}[x_{2.a} \in x_2 \rightarrow \forall x_1[\text{critic}(x_1) \wedge \text{review}(x_1, x_{2.a}) \rightarrow \text{pan}(x_1, x_{2.a})]] : \{\ \}$

$$\forall x_1[\text{critic}(x_1) \wedge \text{review}(x_1, x_2) \rightarrow \text{pan}(x_1, x_2)] : \{\ \}$$

$$\text{review}(x_1, x_2) : \{\langle x_1, \text{critic}(x_1)\rangle\} \qquad \text{pan}(x_1, x_2) : \{\ \}$$

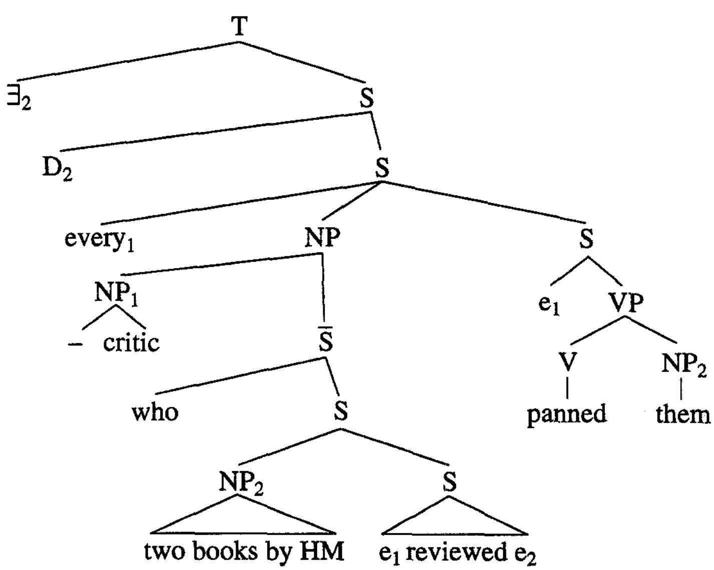
$$\text{review}(x_1, x_2) : \{\ \}$$

The important point about the Distribution Rule in (50) is that it gives the effect of distribution without quantifier scoping. The reason this works is that the distributed position is marked by a free variable x_k in the input to the rule. Something else to note about this rule is that it does not quantify the variable x_k; instead, it quantifies $x_{k.a}$, which we think of as an atomic counterpart of x_k. In the output of the rule, x_k is still a free variable.

Let us return to distributed readings of group indefinites. We saw that these display the same island-escaping behavior as ordinary singular indefinites. Since we have introduced independent semantic mechanisms for indefinites and for distribution giving island-escaping behavior, the hope is that these will simply combine to give the desired reading. The right logical form for the wide scope reading of (44) (top version), repeated below, where distribution takes wide scope over *every*, is (44′):

(44) Every critic who reviewed two books by Henry Miller panned them.

(44′)



The index 2 is distributed and existentially quantified at the maximal level. Given the rules introduced so far, we obtain the following semantic derivation:

(44″)

$$\exists x_2 \left[\begin{array}{c} \text{b-by-HM}^*(x_2) \wedge \text{two}(x_2) \wedge \\ \forall x_{2.a}[x_{2.a} \varepsilon x_2 \rightarrow \forall x_1[\text{cr}(x_1) \wedge \text{review}(x_1, x_{2.a}) \rightarrow \text{pan}(x_1, x_{2.a})]] \end{array} \right]$$

$$|$$

$$\forall x_{2.a}\left[x_{2.a}\varepsilon x_2 \rightarrow \forall x_1 \left[\left[\begin{array}{c} \text{cr}(x_1) \wedge \\ \text{review}(x_1, x_{2.a}) \end{array}\right] \rightarrow \text{pan}(x_1, x_{2.a})\right]\right] : \left\{\left\langle x_2, \left[\begin{array}{c} \text{b-by-HM}^*(x_2) \wedge \\ \text{two}(x_2) \end{array}\right]\right\rangle\right\}$$

$$|$$

$$\forall x_1[\text{cr}(x_1) \wedge \text{review}(x_1, x_2) \rightarrow \text{pan}(x_1, x_2)] : \{\langle x_2, \text{b-by-HM}^*(x_2) \wedge \text{two}(x_2)\rangle\}$$

$$\text{review}(x_1, x_2) : \left\{ \begin{array}{c} \langle x_1, \text{cr}(x_1)\rangle \\ \langle x_2, \text{b-by-HM}^*(x_2) \wedge \text{two}(x_2)\rangle \end{array} \right\} \qquad \text{pan}(x_1, x_2)$$

$$|$$

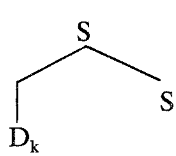
$$\text{review}(x_1, x_2) : \{\langle x_2, \text{b-by-HM}^*(x_2) \wedge \text{two}(x_2)\rangle\}$$

This expression represents the desired reading.

One aspect of the above derivation deserves further examination. At the level of the distribution, I have shown the pair $\langle x_2, \text{book-by-HM}^*(x_2) \wedge \text{two}(x_2)\rangle$ as preserved in the U-set. This is essential, since otherwise the variable x_2 could not be existentially quantified at the next level. That this variable x_2 is preserved as a free indefinite should follow from the fact that it is not quantified by the Distribution Rule. To make this explicit, I propose a revised semantics for the distribution operator which specifies that the U-set is passed up:

(51) *Distribution Rule (final version)*

Configuration:



Interpretation:

$\forall x_{k.a}[x_{k.a} \in x_k \rightarrow 1(S')\,[x_{k.a}/x_k]] : 2(S')$

(where $\varphi[x_{k.a}/x_k]$ is φ with $x_{k.a}$ substituted for x_k)

12. Formally Related Approaches

The device of using restricted variables has the effect of separating the information restricting an unquantified indefinite from the rest of the interpretation of a phrase. In other words, it is possible to recover several separate pieces of information from the semantics of a phrase containing an unquantified indefinite, one of them being the formula restricting the indefinite. This property, which we can view as a kind of information structuring, turns out to be shared with certain approaches to the semantics of presupposition, de re interpretation, and focus. In this section, I will review these approaches, and argue that they should be kept distinct from what has been proposed here for indefinites.

12.1. *Presupposition*

Semantically oriented approaches to presupposition, starting with Karttunen and Peters (1979), employ models involving two semantic values. Thus, for Karttunen and Peters, the semantic value of a sentence, instead of being a single proposition, is an ordered pair consisting of a presupposition and an assertion. A more recent proposal by van der Sandt (1992) is phrased in terms of Discourse Representation Theory (DRT); he suggests that the representation for a sentence involving an unresolved presupposition consists of a pair of discourse representations. For instance, the existential presupposition of the cleft (51a) would be represented as in (51b):

(51) a. It is John who lied.

b.

x lie(x)	John(x)

The box on the left represents the presupposition that someone lied, while the box on the right represents the assertion that that person is John. A definite description can be treated in a similar way:

(52) a. The man lied.

b.

x man(x)	lie(x)

The presupposition box contains information from the definite description, expressing the thesis that the restriction and discourse referent corresponding to a definite description are presupposed. (On this view, see also Heim 1982.)

The relation between this way of encoding presuppositions and the semantics for indefinites proposed in earlier sections is that both assume a structuring of information into two components, as is made explicit in the box representations above. This formal similarity might lead one to try to unite the two theories. Clearly, the most immediate way of doing so is bound to fail: we cannot say that an indefinite description is inherently presupposed, because this is exactly what characterizes a definite description in DRT. That is, if (52b) is the representation for (52a), it cannot also be the representation for (53):

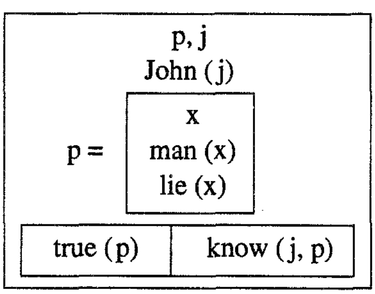
(53) A man lied.

But this just shows that a very naive idea does not work. A less naive approach would be to try to attribute the source of a presupposition to something other than the indefinite itself. More specifically, one might try to show that an indefinite can get wide scope by virtue of being contained in a phrase which for some independent reason is presupposed. I believe that this idea is wrong, because being contained in a presupposed phrase does not in itself resolve the scope of an indefinite. Consider for instance a simple account of the factive presupposition of *know* according to which (54) below introduces a presupposition that its complement is true.

(54) John knows that a man lied.

(54) should be represented by a tuple with a presuppositional component including material from the complement. One option is the following:

(54′)



According to this discourse representation, the proposition that a man lied is described externally from the presupposition-assertion pair. The expression 'true (p)' in the lower left box indicates the presupposition that p be true. The point now is that while *a man* in (54) is part of the description of the presupposed proposition, (54′) represents a narrow scope reading for this indefinite description. A wide scope reading would have the following representation, where the scope of the discourse referent restricted by *man* is maximal.

(54″)

$$\begin{array}{|c|} \hline p, y, x \\ \text{man}(x)\ p = \boxed{\text{lie}(x)} \\ \begin{array}{|c|c|} \hline \text{true}(p) & \text{know}(y, p) \\ \hline \end{array} \\ \hline \end{array}$$

Thus, saying that *a man* contributes to a proposition which is presupposed at the discourse level does not entail that the corresponding discourse referent has maximal scope.

Similar remarks can be made about other constructions. In the case of example (9), repeated below, I argued that there was a distinct wide scope reading for the indefinite *a book he had recommended.*

(9) Professor Himmel rewarded every student who read a book he had recommended.

It is sometimes said that universal (and other) quantifiers introduce a presupposition that their domain is not empty. In this case, the presupposition is that there is a student who read a book that Himmel had recommended. However, such a presupposition would not automatically lead to a wide scope reading for the indefinite. What I am saying is actually obvious: since examples (54) and (9) are ambiguous as to the scope of the indefinite, we would not want a presuppositional theory to impose a wide scope reading. Presumably, someone advocating a presuppositional account of the ambiguity could try to show that the presence of a presuppositional component somehow creates an option for — but does not force — a wide scope reading. I can only say that I do not see how this would work. Also, my feeling (which admittedly does not count for much) is that it is incorrect to say that *a book* in the relevant reading of (9) is presupposed, even at an embedded compositional level; I think it is simply asserted.[23]

Thus I conclude that a mechanism separate from the semantics of presupposition is required to derive the difference between (54′) and (54″) on the one hand and the wide scope reading of (9) on the other.

[23] Independently, I am skeptical about the idea that there is a genuine presupposition introduced by quantifiers. The observed 'pseudo-presupposition' fits the description of a standard conversational implicature: if the domain is empty, a universal quantification becomes vacuously true, and a speaker who knows the domain to be empty would therefore not be pragmatically justified in using a universal quantifier, except in special circumstances. Consequently, use of universal quantification produces the conversational implicature of a non-empty domain.

This conclusion is not necessarily irrefutable, however, since I might be ignoring some aspect of the correct theory of presupposition.

12.2. *Structuring in De Re Interpretation*

A different use of information structuring is found in Cresswell's and von Stechow's theory of de re interpretation (Cresswell 1985, Cresswell and von Stechow 1982). An argument of a propositional attitude may be structured into a tuple of a relation and appropriate arguments; this has the effect of inducing a de re interpretation of the arguments. For instance, in Quine's classic "Ortcutt" – example (Quine 1956) – *Ralph believes that Ortcutt is a spy* – a de re reading for *Ortcutt* is associated with the following structure:

(55) $\text{believe}(r, \langle \lambda y[\text{spy}(y)], o \rangle)$

The semantic object that appears as the second argument of *believe* here is known as a 'structured proposition'. In this case it is a pair consisting of a property and an individual, namely the individual which is the semantic value of the NP *Ortcutt.* I will speak of the second element as the 'argument slot' of the structured proposition; in general, there may be more than one argument slot.

In the semantic rule for *believe,* acquaintance relations are introduced for the argument slots of a structured proposition combining with *believe,* so that Ralph may pick out Ortcutt in the way described by Quine, as the man he saw at the beach. Cresswell and von Stechow argue for applying this scheme of de re interpretation to structured propositions involving arguments of various types. What is relevant here is that in certain cases, the resulting structured propositions are somewhat similar to the objects which I have proposed as the interpretations of sentences with unquantified indefinites. Consider the following scenario: Ralph lives in an apartment below an exercise studio, and from time to time he is kept awake by noisy workouts. There are in fact two kinds of people who use the studio: dancers and meditators. It is the dancers who keep Ralph awake, but Ralph has formed an incorrect belief that the noisy exercisers are Tae Kwon Do students. As you enter the studio at midnight to do your daily meditating, we hear Ralph groan in the apartment below, and in response to your question about what he is going on about, I say:

(56) He probably believes that a dancer has entered the studio.

Ralph would say that the problem has to do with a Tae Kwon Do student, but since I don't want to go into Ralph's incorrect views, I use a description which instead exploits your and my view of who the noisy people are. This way of talking is defensible, since a systematic correspondence can be established between the role of the property of being a Tae Kwon Do student in the worlds consistent with Ralph's beliefs and the property of being a dancer in the worlds which are consistent with our beliefs; in each case, the property is the unique property among the properties describing practitioners of the various exercise regimens which, in the relevant worlds, is instantiated by the people who have kept Ralph awake. Cresswell and von Stechow would give a semantic analysis in which either the common noun *dancer* or the NP *a dancer* is interpreted de re. In the former case, the property of being a dancer is in the argument position of the structured proposition:

(57) $\text{believe}(r, \langle \lambda P [\exists x [P(x) \wedge \text{enter-the-studio}(x)]], \text{dancer} \rangle)$

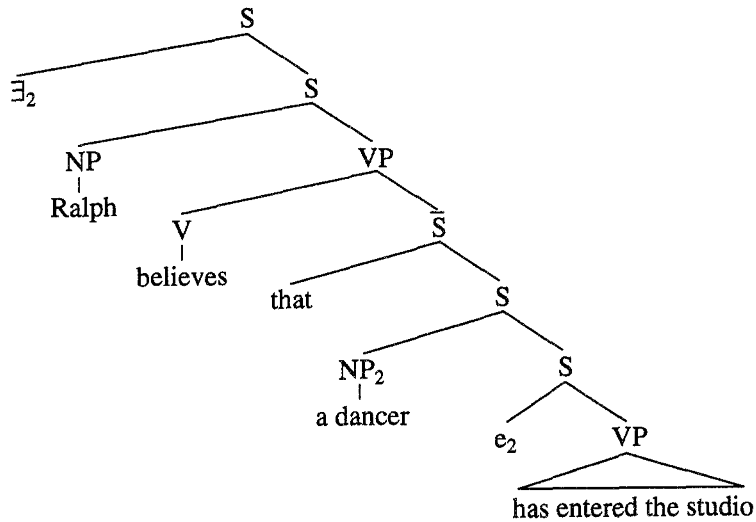
This representation is then interpreted with reference to an acquaintance relation which picks out the property of being a Tae Kwon Do student in Ralph's belief worlds.

I have proposed semantic representations in which restrictions on indefinites are semantically encoded in a way that can broadly be considered a matter of structuring restrictive properties. Does this have anything to do with structuring in the service of de re interpretation? In particular, is there any relation between the representations I have employed and a representation such as (57), where a property is in the argument position of the structured proposition? I believe the relation is merely formal, and that even at the formal level there are differences. The main point is that (57) represents a narrow scope reading for the existential quantification associated with *a dancer*. The effect of structuring is to allow the semantic rule for *believe* to refer to the property of being a dancer, inducing a de re interpretation of this property; the scope of the existential quantification is unaffected. For comparison, here is the 'structured proposition' assumed in my proposal as the semantic value of the embedded S:

(58) $\text{enter-the studio}(x_2) : \{\langle x_2, \text{dancer}(x_2) \rangle\}$

This representation is similar but not identical to (57). There is a free individual variable in the lefthand expression of (58) whereas the variable bound by the lambda in (57) has the type of a property. In combination with other parts of the theory, the effect is a wide scope reading, assuming a logical form with existential closure at the matrix level:

(59)



This is often described as a de re reading, in the ordinary sense: there is a dancer such that Ralph believes he or she has entered the studio. In fact, in order to get a sensible semantics for this wide scope reading, it is advisable to assume a de re interpretation (in Cresswell and von Stechow's sense) of the variable associated with *a dancer*. If there is a dancer such that Ralph thinks he or she has entered the studio, then Ralph must have some kind of cognitive access to that particular dancer; this can be achieved by means of an acquaintance relation to that individual. The semantic argument of *believe* would be:

(60) $\langle \lambda x[\text{enter-the-studio}(x)], x_2 \rangle$

An acquaintance relation to x_2 would be introduced by the semantic rule for *believe*. Thus a wide scope reading (obtained by means of structuring in the sense of restricted variables) may semantically trigger structuring in the service of de re interpretation. Nevertheless, the two mechanisms are distinct.

12.3. *Structuring in the Theory of Focus*

Finally, von Stechow (1989, 1991), Jacobs (1983), and Krifka (1988) use structuring in the semantic representation of focus. Krifka (1988) employs a 'structured meaning' approach to focus in analyzing generic indefinite descriptions. For example, (61a) below has a reading where the bare plural *cats* (which, let us assume, is an indefinite description) is interpreted generically. A plausible rendering of the semantics of this example, which takes into account the focus on *likes*, is (61b).

(61) a. John usually likes$_F$ cats.

b. $\text{usually}_{x,R}(\text{cat}(x) \wedge R(j,x) \wedge R \in \{\text{like}, \text{dislike}\}, R = \text{like})$

The generic reading for *cats* is reflected in the fact that the quantifier *usually* binds the variable x. In addition, there is a bound variable R ranging over relations; the set of relations it ranges over must be considered contextually specified. Krifka proposes that structured representations encoding the semantic contribution of focus are the input to a semantic rule for *usually*. The question, for my purposes, is whether the information contributed by the focus and the information contributed by the indefinite are to be treated in a uniform way. This would be attractive if it meant that the focus-related variable R in (61b) and the indefinite-related variable x could be treated uniformly by the semantic rule for *usually*. However, I think there is reason to believe that the relation between focus and indefinites is not a direct one.

Rooth (to appear) argues that certain cases of generic indefinites have no connection to an identifiable focus. We have already looked at an example of the kind he discusses:

(62) Rarely does every critic who reviews a book by Henry Miller like it.

The reading we are concerned with is the one where the indefinite *a book* contributes to the restriction of *rarely*, while the quantifier *every*, together with the rest of the semantic material in the sentence, contributes to the scope. This reading can be paraphrased as 'Few books by Henry Miller are such that everyone who reviews them likes them'. Rooth points out several problems with the analysis of this type of example. First, there is no observable conditioning of the partitioning into restrictor and scope by focus. Second, the restrictive *a book* is buried inside an NP which contributes to the scope, namely the NP headed by *every critic*. This is a problem since the empirical generalization which Krifka (as well as Rooth in the cited paper) assumes is that material contributing to the scope is to be marked by a focus. How can the discontinuous NP *every critic who reviews . . . by Henry Miller* be marked with a focus without that focus also marking the included indefinite *a book*, which is supposed to be nonfocused so that it will end up in the restrictor? Rooth suggests that the proper account of such examples has nothing to do with focus.

If this argument is convincing (and I think it is), we cannot reduce the behavior of the indefinite in (62) to the theory of focus. Given the island-escaping behavior of *a book*, I suggest that this NP gets its semantic scope by means of the U-set mechanism I have proposed, without reference to any focus-determined information. This still leaves open the possibility that in cases where focus is involved, the representation of focus and of indefinites is uniform. In the case of (61a), which certainly seems to have something to do with focus, assuming a representation for both focus and indefiniteness in terms of U-sets and working backwards from (61b) suggests the following representation:

(63) $$R = \text{like} : \left\{ \begin{array}{l} \langle x, \text{cat}(x) \rangle \\ \langle R, R(j, x) \wedge R \in \{\text{like}, \text{dislike}\} \rangle \end{array} \right\}$$

The first tuple in this U-set corresponds to the indefinite, and the second one to the focus.

While something like this might prove to be the right account of the input to the semantic rule for *usually* in (61), the technical question we are concerned with here is whether a representation such as this is *in general* the semantic representation of focus. I will not be able to provide a definitive argument against this claim here, but I think one needs to be skeptical about it, for the following reason. The semantics of focus is used in a lot of different constructions (see for instance von Stechow 1989). If focus is systematically rendered in terms of the semantics of indefinite descriptions, we would expect interactions with indefinite descriptions to show up in all of these constructions. However, this appears not to be right. Take *only*. In (64a) it interacts with focus to produce a reading something like (64b). On the other hand, there is no evident interaction with the indefinite description in (65).

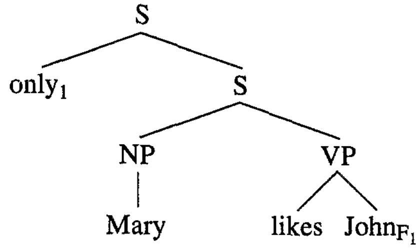
(64) a. Mary only likes John_F

b. $\forall x[\text{like}(m, x) \rightarrow x = j]$

(65) Mary only likes a cat.

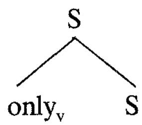
What interaction with the indefinite description would be predicted by a theory which equated focus with indefinite descriptions? To see this, we have to look at a semantic rule for *only* stated in terms of the semantics of indefiniteness. Assuming the logical form (66a) and the semantic representation (66b) for the S that *only* combines with, (64b) can be obtained by applying the rule given in (67).

(66) a.



b. $x_1 = j : \{\langle x_1, \text{like}(m, x_1)\rangle\}$

(67) Configuration:



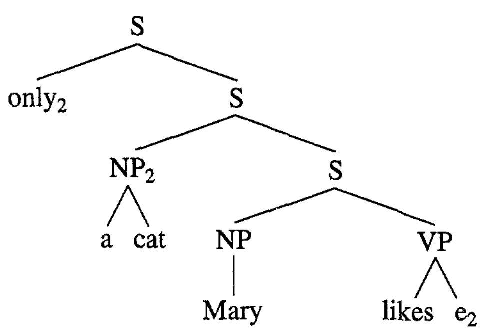
Intrepretation:

$\forall v[\varphi \rightarrow 1(S')] : (2(S') - \{\langle v, \varphi\rangle\})$
(where $\langle v, \varphi\rangle \in 2(S')$)

So the behavior of *only* with respect to an argument containing a focus is exactly as we want it to be.

Now let us look at an argument containing an indefinite. Let us assume the following logical form for example (68):

(68)



The semantics of the argument of *only* is the following:

(69) $\text{like}(m, x_2) : \{\langle x_2, \text{cat}(x_2)\rangle\}$

If we now apply the semantic rule (67), we obtain:

(70) $\forall x_2[\text{cat}(x_2) \rightarrow \text{like}(m, x_2)]$

This reading, 'Mary likes every cat', is certainly not a possibility for (65). The source of the problem, obviously, is the assumption that the indefinite in (65) has a semantic representation isomorphic to the representation of the focus in (64a), and so has the potential to interact with *only*. Note that what is under discussion here is a predicted reading for (65) in the *absence* of focus. The sentence certainly has a variety of readings corresponding to different focus options, but this does not affect my line of argument, since none of these is equivalent to (70).[24]

Summing up this subsection, we have two negative conclusions:

(i) generic indefinites should not be systematically reduced to the theory of focus;
(ii) the semantics of focus should not be stated in terms of the semantics of indefinites advocated in this article.

Note that I have left open the proper analysis of (61a); in light of (ii), an approach assuming the representation in (63) would have to obtain that representation indirectly, not as a direct consequence of the semantics of focus.

12.4. *Conclusion on Formally Related Proposals*

I have looked at three applications of some kind of semantic structuring, in the domains of presupposition, de re interpretation, and focus. In each case, I have argued that, despite formal similarities, the theory in question should not be unified with the semantic representation for unquantified indefinites proposed in this paper. Thus we should view semantic structuring not as a unitary linguistic phenomenon, but rather as a formal technique with several linguistically distinct applications.

13. General Conclusion

The theoretical distinction Kamp and Heim draw between quantifiers and indefinites is based mainly on examples of donkey sentences. Their observation is that indefinites are free variables which get their quantificational force from whatever quantifiers are around. In this paper I introduce another piece of empirical evidence supporting this distinction, one that involves island-escaping indefinites resulting in intermediate readings. My claim that indefinites have different scope properties than quantifiers fits nicely with the Lewis-Kamp-Heim proposal that the former but not the later contain a free variable (and a restriction on it). In line with this thesis, I assign indefinites scope by indexing, relying on the U-set mechanism to

[24] The reason why I stated above that this argument is not definitive is that other semantic rules for *only* might be consistent with the focus data. The appropriate strategy to counter my argument would be to try to come up with a rule which is somehow blocked semantically in cases where the restricted variable originates with an indefinite description rather than a focus.

carry up the restriction on the variables. The data on the wide scope readings of plural indefinites strengthen my theoretical claim about the scope of indefinites. While my analysis of wide scope group indefinites is identical to that of singular ones, wide scope distributive readings involve in addition an independently motivated island-insensitive distributive operator. Finally, I have not come to a conclusion regarding the issue of Fodor and Sag's referential indefinites with which I opened my paper. It seems we do not need them anymore in the theory of indefinites at hand, since the maximal scope reading can be derived in the same way as the intermediate ones. Getting rid of redundant entities is always a recommended strategy. However, there is one datum which prevents me from taking that step. Initial *if*-clause islands with indefinites appear to lack intermediate readings although they have maximal ones. At least for such examples, maintaining the concept of referential indefinites might be useful. But whether or not referential indefinites exist, in addition to free indefinites, we need the latter in order to resolve the issue of intermediate readings.

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