WITHOUT A TRACE: INTERPRETING FULL COPIES

OF QUANTIFIER PHRASES IN SEMANTICS

by

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ABSTRACT

Interpretation of quantifier phrases in a semantic framework has been satisfied in the past through quantifier raising, which leaves a trace of type <e> to combine with verbs where a quantifier phrase of type <<e,t>,t> cannot. With more and more evidence emerging in support of the copy theory of movement, the issue emerges of how to treat quantifiers. Current research proposes that quantifier phrases leave copies in the syntax but convert into a trace for semantic interpretation. I show that such conversion is unnecessary and that quantifier phrases can be interpreted by semantics as full copies.

Sauerland proposed that full copies of moved quantifier phrases exist in syntax but that the quantifier phrase must undergo a transformation to become something more like a trace to be interpreted semantically, a method accepted and later formalized by Fox and incorporated into current research by Takahashi.

All of these researchers left unnoticed work previously set forth by Kratzer, which provides a new semantic model that I call the Event Model. This model is a semantic counterpart to VP shells, incorporating proposals put forth by Larson, Hale and Keyser, McIntyre, and others. Kratzer specifies a new single semantic type for all verbs, a new node called Voice to attract an external argument, and a shell structure that parallels VP shells in syntax.

I show in this paper that Kratzer's model allows quantifier phrases to combine directly with verbs in subject and object positions. I utilize a new semantic type for

quantifier phrases that she describes in later research, and I explain how they combine with verbs. I then show how full copies of quantifier phrases and verbs can occupy different positions in the syntactic tree and that they can be interpreted in the semantic interface without requiring traces in order to resolve type mismatches. Last, I confirm that my proposal does not cause problems for scope interpretation. Using works of Fox, Takahashi, McCarthy, and Aoun and Li, I develop a model that allows the syntax to delete copies of moves quantifier phrases from interpretation and allows the semantic interface to interpret the remaining quantifier phrases for scope relation, and I formalize a rule for that model.

Dad, this one’s for you.

CONTENTS

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First and foremost I thank my wonderful wife, Fiona, for her support. She has seen me through many stressful times and shared in my exultation of being involved in and successfully completing my academic program. Her strength and nudges in the right direction helped me many times to keep to the books instead of spending all my spare time with her and my children (two of whom were born during this period).

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1. INTRODUCTION

Widened acceptance of the Minimalist Program of syntax has brought forth research that seeks to validate the copy theory of movement. The idea of moved constituents leaving traces in their wakes is shifting to a model in which they leave full copies of themselves in their movement chains. Fox (2002:66) poses an interesting question regarding this new theory of movement: "How do the copy theory of movement and the traditional alternative [which leaves traces] compare with respect to semantic interpretation?" It turns out that one situation persists for which it appears that copy theory falls short and traces are still needed for semantic interpretation: when a quantifier phrase seeks to pair up in object position with a verb, a mismatch occurs between their respective semantic types, and the best resolution to date is to allow the quantifier to move and leave a trace behind, contrary to copy theory. If quantifier phrases are to comply with copy theory, this situation needs to be changed.

I propose that quantifier phrases can be interpreted in the semantics interface just like any other moved constituent: as a full copy. In this paper, I will show that there is no need to hold to the idea of traces from Government and Binding theory just so that a bound variable of a quantifier can be available for the semantics interface to interpret. To accomplish this, I will first lay out the relevant items from syntax and semantics: the definition and nature of quantifiers, the copy theory of movement, scope reconstruction, and the semantic interface. Following that, I will outline the current problem in semantic theory of type mismatch between quantifier phrases and verbs, show the traditional solution involving traces, and describe how current research continues to stay with that solution in spite of the evidence that copies, not traces, exist in the syntax. I will propose that, in order to allow quantifiers and verbs to combine harmoniously, verbs must have their multiple semantic types reduced to a single type. I will support this claim by introducing work from Kratzer (1996) that produces a semantic model for verbs which mirrors VP shells and is compatible with the ideas of Hale and Keyser (1993). I will then show that this new model of semantics can be expanded to allow quantifiers in object position to combine directly with verbs, eliminating the problem of type mismatch and the need to present traces to the semantic interface for interpretation. And because the very nature of quantifiers necessitates consideration of scope relations, I will use principles and observations from current research to produce a rule that defines how the semantic interface can interpret scope in the new semantic model.

2. RELEVANT COMPONENTS FROM THEORY

In this chapter I discuss components of syntactic and semantic theory that are relevant to the proposal of this paper. In section 2.1, I describe quantifier phrases (QPs) and show how they differ from other determiner phrases (DPs)[1] by holding scope ambiguity. In section 2.2, I look specifically at syntax, outlining copy theory and scope reconstruction. In section 2.3, I introduce the necessary aspects of how semantics interfaces with syntax to interpret a sentence.

2.1 Quantifiers, Ambiguity, and Scope

QPs are a type of DP that do not indicate a specific entity in the world of discourse, using determiners such as *some, every, all,* or *each.* This means that they cannot be classified as specific individuals of type <e> for semantic interpretation, and they thus can cause ambiguity in a sentence's meaning.

This leads to the idea of scope. Scope sets the QPs of a sentence into a relationship with each other that defines for the speaker and listener which QP should receive the primary focus for proper interpretation (in other words, which QP should receive wide scope in relation to the other). Take, for example, the sentence *all boys hugged some girl.* Since this sentence contains QPs instead of single, specific individuals (like *Jack* and *Jill*), its intended meaning is ambiguous. If *some girl* has wide scope,

[1] I assume that all noun phrases are embedded within a higher DP, whether or not a determiner is present. I will thus refer to all nonquantifier noun phrases as DPs throughout this paper.

then the sentence means that all boys each hug some single girl. If, however, *all boys* has wide scope, then the sentence states that for each boy there exists some single girl that he hugs.

2.2 Syntactic Components

In the subsections below, I will discuss movement and scope reconstruction by first presenting how they were perceived in Government and Binding Theory (GB) and then discussing how they are handled in MP, which is the theory of syntax adopted herein. Such a comparison is important, for interpretation of QPs in semantics continues to use a remnant of GB (discussed in detail in Chapter 3).

2.2.1 Movement and Copy Theory

In GB, it was considered that when constituents such as QPs move, they leave a bound trace in their original position of the tree. We understand that a trace represents the syntactic and semantic content of the moved constituent to which it is bound, but the trace itself is “contentless.” This is to say that it contains no lexical content (meaning that it cannot be realized phonologically); it contains no syntactic features (such as Tense or Case); and it is of the semantic type <e> (see Heim and Kratzer 1998:186), which can serve as the input or output of a semantic function, but cannot perform any semantic action on its own.

MP states instead that when a constituent moves, it leaves a full copy of itself in the original position of its movement chain, which copy includes lexical content and some or all of the syntactic features of the constituent (Chomsky, 1993; Chomsky, 1995;

Marantz, 1995; Sauerland, 1988). It appears also that the copy contains the semantic type of the constituent in addition to the syntactic and lexical content, as is evidenced by statements such as this one from Takahashi (2006:81): "[T]he lower copy of the object . . . cannot combine with the transitive predicate *read,* which demands an element of type e [such as a trace] as its first argument" (emphasis in original).[2]

One recently posited view of copy theory, Internal Merge, supports this notion. Chomsky (forthcoming) suggests that there are not multiple copies of a moved constituent, but that there is one single constituent which checks off its features on multiple nodes of the syntactic tree not through movement, but bieng simultaneously attached to every appropriate node. In such a model, the semantic type would necessarily be the same for each "copy" since it is really a single constituent plugging itself into the tree, not multiple versions of one. This version of copy theory best allows for a constituent to retain its semantic type in all positions on the tree, and so I adopt the model of Internal Merge for this paper.[3]

2.2.2 Scope Reconstruction

The original idea of how QPs gained scope was that it went through the process of quantifier raising (QR). In QR, the movement of QPs to higher positions on the syntactic tree defines their scope relationship: the head of each movement chain is the scope-

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[2] Takahashi uses the term "combine" to indicate the process (such as merge, Function Application, adjunction) by which two constituents in a tree form a new constituent. I will use the same term throughout this paper.

[3] Even though I adopt Internal Merge, I will refer to the copy phenomenon as movement throughout the paper, and the syntactic trees that I will present later show copies and movement arrows in order to simplify the creation and reading of trees.

bearing element, so the QP that rests highest in the tree in relation to the others gains wide scope.

QR may actually be the wrong model for scope in MP. Aoun and Li (1989, 1993) revealed that a QP can have wide scope as long as the head of its chain c-commands any chain member of the other QPs in a sentence, which means that the highest QP in the tree does not necessarily bear wide scope. Aoun and Li call this the Scope Principle, and it has been widely adopted as the method for determining scope relations in MP (see Chomsky 1993, Hornstein 1995, Marantz 1995, Radford 1997).

2.3 The Semantic Interface

When a tree is created in MP, at some point it diverges to produce two forms: Phonological Form (PF) for phonological realization and Logical Form (LF) for semantic interpretation (Chomsky 1993). The semantic interface reads the LF tree and applies semantic rules to it (Heim and Kratzer 1998:45).

Semantic rules govern how different nodes can combine with each other in the LF. Every node on the LF tree has a specific type so that it can interact with its neighboring nodes. The two basic semantic types are <e> (individuals) and <t> (truth values). Different combinations of these two types yield functions. The nodes of the tree all combine to create a well-formed sentence that represents a truth condition of type <t>.

Three items are important to the topic of this paper. First is the semantic rule of Function Application, in which one node accepts the semantic type of the other as input and produces an output of a node with a new type (for example, a verb of type <e,t> will combine with a node of type <e> and output a node of type <t>). Second is the semantic type for QPs, that of <<e,t>,t> (Heim and Kratzer 1998). Third is the set of semantic types for verbs: <e,t> (unergative, intransitive); <e,<e,t>> (transitive); or <e,<e,<e,t>>> (ditransitive) (Heim and Kratzer 1998).

The variety of types for verbs creates the main obstacle to QPs being interpretable to semantics as full copies, because they create a problem with using Function Application to combine verbs and QPs together. I will address this problem in detail in the next chapter.

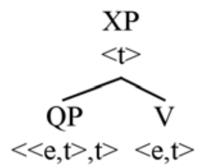
3. THE PROBLEM AND SOME SOLUTIONS

In this section I discuss why combining of QPs with verbs is problematic to copy theory and what resolutions exist to resolve the issue. In section 3.1, I explain the major argument against copy theory in semantics of type mismatch between QPs and verbs. In section 3.2, I describe how the type mismatch problem has been resolved in the past through QR and traces, and I explain why this is not compatible with copy movement. In section 3.3, I discuss one solution that has been proposed in recent literature to reconcile the evidence of copy movement in syntax with the need to have traces in semantic interpretation, and I then explain why I disagree with it in terms of MP and semantic theory. In section 3.4, I propose a path toward a different solution, that of changing the semantic type of verbs. In section 3.5, I introduce the work of Kratzer (1996) to define verbs as events and to define a new semantic type for verbs, and I show support from the literature for her proposal. In section 3.6, I show how Kratzer (1996) defines subjects as external arguments, and I give support from the literature. In section 3.7, I show how Kratzer (1996) combines external arguments and event verbs, and I support her with a comparison of her structural model to VP Shells. In section 3.8, I explain the functions necessary to create the semantic trees in Kratzer's (1996) model.

<u>3.1 Problem with Copy Theory: Type Mismatch</u>

As stated in section 2.2, a QP has the semantic type <<e,t>t>. This is not problematic when we seek to combine it with an intransitive or unergative verb of type <e,t>. The QP takes the verb as its input, and it outputs type <t>, as shown in (1).

(1)



The example in (1), however, is the only harmonious pairing of a QP and a verb via Function Application. It has been well established that all QPs are of type <<e,t>,t> and no other (Heim and Kratzer 1998).[4] Verbs, on the other hand, have more than one variety, and therefore can have one of three types as described above: <e,t>; <e<e,t>>; or <e<e<e,t>>>. As stated by Takahashi: "Since QPs are second order predicates whose semantic type is <<e,t>,t>, they are interpretable only in a position sister to an element of type <e,t>. Therefore, QPs are not interpretable in object position of transitive predicates" (2006:29, see also Heim and Kratzer 1998:179).

If a QP is not interpretable in object position, and if QPs undergo movement in syntax, then we conclude that the type of movement that QPs undergo cannot be copy movement (since a copy of a constituent also contains a copy of its semantic type). This conclusion gains strength when we consider how this problem of mismatch is resolved in semantics.

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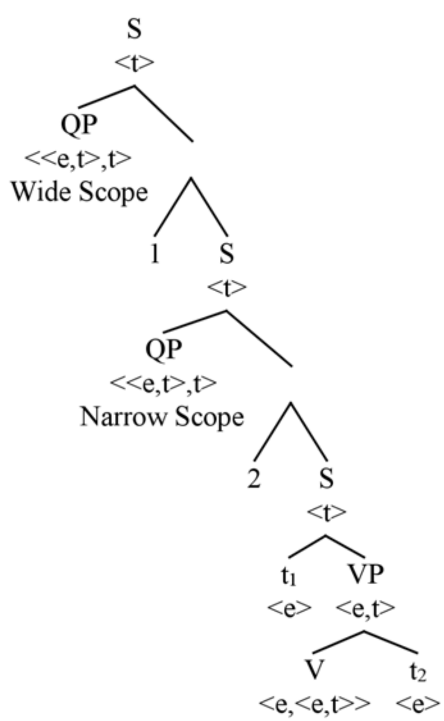
[4] See Chapter 7 of their work for a complete analysis and explanation of the semantic type of QP.

3.2 Resolution with QR

To resolve the type mismatch, formal semantics relies on the approach that QPs in a sentence undergo QR. This movement is after the fashion of GB theory, where movement leaves traces which are interpreted as contentless entities in LF.

Since semantic interpretation is performed on the LF after movement has taken place, there are no QPs in either object or subject positions of the verb, only traces. According to Heim and Kratzer, “This movement operation, then, might feed semantic interpretation . . .” because traces are interpreted in semantics as bound variables (traces) of type <e> (1998:185). An object of type <e> has no trouble combining with a verb of any type via Function Application. The moved QPs can be joined to the rest of the sentence by Predicate Abstraction instead, which both avoids a type mismatch and allows each QP to bind its corresponding trace, and then they can be interpreted for scope, as shown in (2).

(2)



While this provides a workable solution for the type mismatch problem, it depends on the LF containing traces. This remnant of GB is simply not in harmony with MP and the copy theory of movement.

3.3 Solution for QP Interpretation with Copy Theory: Trace Conversion

With the incompatibility of a QP with the object position of a verb well established, how can it be reconciled with the widely supported theory that movement leaves copies? Fox (1999a, 1999b, 2002) devised a method to work with the apparent conundrum, a method supported in more current research (see Takahashi 2006).

Interestingly, while Fox's solution is compatible with copy movement and semantic interpretation, it does not actually allow a copy of a QP to exist in the original object position for the semantic interface to interpret. He says that "the semantic component can treat lower copies [of a chain] as variables" (2002:66). This sounds very much like the QR and traces solution from the previous section. How can it also be the same solution for framework that includes copies? He gives the following explanation.

Consider the sentence *which book did Mary read.* The LF would look like (3).

(3) which book did Mary read which book

This LF is traditionally uninterpretable by semantics. Fox proposes a solution called Trace Conversion, in which the "copy [of the QP] is converted into a definite description" (Fox 2002:67)[5], or "it converts the copy into a syntactic object that receives the same interpretation [and type] as that assigned to a trace" (Takahashi 2006). Such conversion allows the copy to be interpretable in the semantics interface. Under Trace Conversion, the LF in (3) becomes the one in (4) for semantic interpretation (the italicized phrase represents the variable).

(4) which book λx [did Mary read *the book x*]

In this new LF, "*book x* is interpreted as a definite description, *the book identical to x,* yielding an interpretation paraphrasable as *which is the book, x, such that Mary read the book identical to x*" (Fox 1999a:182, emphasis in original).

Trace Conversion thus allows a copy to remain intact in the syntax while producing a trace for the semantic component. In this manner, copy movement can occur in the syntax while not causing any difficulty for the semantic interpretation. It appears to be a fine marriage between the behavior of current syntactic theory and the needs of semantic theory.

There are problems with the approach, however. A system like MP seems to support as its tenet the principle of Occam's razor: the simplest solution is the best. Trace Conversion introduces complexity into three areas.

First is in the original proposals of MP (Chomsky 1993), in which the effort of leaving even a contentless trace was pushed away in favor of a simpler approach of a

[5] Fox (1999a) states that this idea comes from Sauerland 1998. However, Fox is the one who formalized the principle in Fox (1999a, 2002).

moved constituent leaving full copies in lower chain positions. Trace Conversion forces the notion of trace back into the very model that is supposed to replace it.

Next is the traditional model of semantic interpretation: semantics views the LF tree, reads each node's respective type, and verifies that all the nodes combine through approved methods (see, among others, Heim and Kratzer 1998, Hornstein 1995, Kratzer 1996, Kratzer forthcoming, Pylkkänen 2002). Trace Conversion interferes with this simple model by proposing that LF must undergo a transformation before the semantics component can interpret it.

Last of all, is the current and supported notion of copy theory, Internal Merge.[6] Internal Merge simplifies the copy chain by defining a "copy" as one single constituent that links to multiple positions on the syntactic tree (Chomsky, forthcoming; see also section 2.2 above). In the Trace Conversion school of thought, conversion of lower copy chain members would actually be a change to the constituent itself, resulting in traces being represented for it in all positions in the movement chain. This would make the LF uninterpretable to the semantic component unless some other additional process applies to present the semantic content of the constituent to the semantics component. In a Trace Conversion Model, two conversions become necessary to accomplish what is already in place with a copy, namely, at least one interpretable constituent in the chain.

3.4 Resolving the Type Mismatch at the Root by Changing the Types

A simpler solution than Trace Conversion is to find a way by which copies of QPs and verbs can combine directly in the semantics and thus be interpreted from LF. It is abundantly clear that a QP of type <<e,t>,t> cannot combine directly with a transitive

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[6] See Kobele (2006), Marantz (1995), and Takahashi (2006)for support of Internal Merge.

verb of type <e,<e,t>> or <e,<e,<e,t>>> through Function Application. If the types do not match, then one possibility is that we simply have the wrong types defined for the entities in question. The solution is to create new types. Either QPs must have three different types that each match the different nodes projected from a verb, or verbs must be changed to have only one type. Since there is strong and widely accepted evidence that QPs are of a single type (Heim and Kratzer, 1998)[7], I will pursue the path of determining a single type for verbs.

What, then, should be the type? Since the problem presented in this paper is between QPs and verbs, it is logical to look to the QP for some guidance. A QP is of type <<e,t>,t>, which leads to the easy conclusion that verbs, regardless of what arguments they take, should be type <e,t> in order to provide a compatible input to the QP. This does not appear to be a valid solution, however, because it is difficult to understand how a verb of type <e,t> could possibly combine with a subject and object or with multiple objects. Reducing to a single verb type is still a valid course of action, but type <e,t> is not the correct type.

3.5 Verbs as Events and a New Semantic Type

Kratzer (1996) took the initiative on laying an inviting foundation for a new semantic model in which verbs have a single type, which I call the Event Model. The whole of Kratzer's (1996) work revolves around one central theme: a sentence describes an event, and that event is defined by the verb. This concept of verbs as events is important because it implies that verbs may not need to have the types <e,<e,t>> and <e,<e,<e,t>>>, which is to say that the verb itself does not inherently contain some

[7] For additional support, see also Fox 1995, 1999b, 2002; Sauerland 1998; Takahashi 2006).

semantic meaning that requires it to project multiple times to attract its arguments. Verbs can be a single semantic entity instead of several.

Kratzer comes to the same conclusion. She creates the label <s> to represent event (1996:121), and defines a single verb type of <e,<s,t>>, which represents a function from an individual to a function from events to truth values (1996:122). Her function for an event-driven verb is shown in (5) for the verb *buy*.

(5) λx λe[buy(x)(e)]

Kratzer (1996:111)

Support for the idea of verbs as events comes from Hale and Keyser (1993). In their paper, they propose that, contrary to previous thought, there are actually no theta roles for verbs to assign to their arguments. Instead, they say that the "category V is associated with the elementary notional type 'event'" (Hale and Keyser 1993:68). This means, as they explain later, that a verb is not an entity that seeks an agent and a theme, but that it simply defines the event taking place, and that "the [theta] roles are derivative of lexical syntactic relations" that are apparent in the VP structure (Hale and Keyser, 1993:69; see also Baker 1997, McIntyre 2004, Pylkkänen 2002).

3.6 Severing the External Argument

If the function in (5) is applied to the theme *your slippers* in the typical manner (via Function Application), the following occurs: "[T]he VP ends up denoting a property of events that is true of any event if it is an event of buying your slippers. *No agent* *argument has come into existence*" (Kratzer 1996:112–113, emphasis added). This discovery suggests that an Event Model for sentences cannot host an internal subject.

This observation corroborates the conclusion found in the syntactic analysis of Hale and Keyser (1993). In their work, they find that the subjects of unergative sentences, if they assume the VP-internal subject hypothesis, are incompatible with the causative (event) syntactic structure that they proposed previously in the same work (1993:74–75). This led them to another conclusion, which they expanded also to transitive verbs: the subject argument can be external to the VP. This means that the subject does not have to originate within the VP structure, but instead can receive its relationship to the predicate by the syntactic structure (Hale and Keyser, 1993:81; for further treatment of the topic, see also McIntyre 2004, Pylkkänen 2002, among others).

The ability of subjects to be external gives further support to the notion that verbs are of a single type. If the subject argument can be external, then there is no need to apply a type to a verb (such as <e,<e,t>>) to enforce the notion that all arguments are always internal.

3.7 Combining the Subject and the Verb

How does an external argument come to be associated with the verb with which it is traditionally associated by that verb's argument structure? Kratzer claims that there is a syntactic head, called Voice, that introduces the argument (1996:120). The argument can be internal (in unaccusatives) or external (in transitives), as will be shown later. Voice serves as a landing place for the verb, which in a transitive construction allows the verb to move away from its object and make itself available to accept a subject. It also allows the number of arguments to be determined by the syntax instead of by the verb (Kratzer 1996:111), which is in accordance with the proposal of Hale and Keyser (1993).The structure of the verb with the Voice node is shown in (6).

(6)

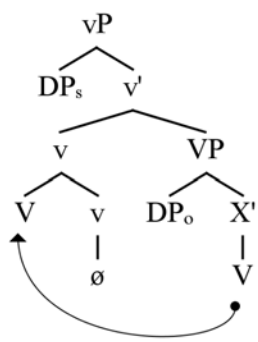
This looks remarkably like a syntactic structure know as the VP shell. VP shells are a way to represent verbs and how they actually combine with their subject and object arguments. A VP shell has two major components:

1. A core VP structure in which arguments originate.
2. An outer shell (called vP) with which arguments combine.

Larson (1988) laid out the idea of moving a verb to multiple shells in other positions on the syntactic tree very well in his analysis of the double object construction. He states that for the sentence *John sent Mary a letter,* there exists “a clauselike VP whose ‘subject’ is *a letter* and whose ‘object’ is *(to) Mary*” (Larson 1988:335, emphasis in original). The verb undergoes what he calls V Raising, where it moves from the lower position (or “shell”) that contains the object to the higher shell that contains the subject.

Specifically, a verb first combines with the object DP in Spec-VP. The verb then raises out of VP to adjoin with v, forms a new head v, and combines again with the tree in the head position of v'. At that point, the subject combines with v' in the Spec-vP position. This is illustrated in (7), where DP_s and DP_o stand respectively for the subject DP and the object DP.

(7)



Note the similarities between (6) and (7). Indeed, there is a one-to-one correlation between the nodes in Kratzer's model and those of the VP shell. Voice corresponds to v, Voice' to v', and VoiceP to vP. Such correlation means that the Voice structure serves well as a semantic interpretation of the VP shell. The new semantic types for these nodes the Event Model (as well as that for verbs) are outlined in Table 1.

<u>3.8 Functions in the Event Model</u>

As was shown above, Function Application did not work in the Event Model with a syntactic structure that assumed internal subjects. We will see, however, that it does work in the Voice structure of the Event Model, allowing arguments to combine harmoniously with the verb. The Voice nodes, however, cannot work in this manner. Since Voice is of type <e,<s,t>>, it cannot combine directly with VP, which is of type <s,t>.

Kratzer resolves this by proposing a semantic rule called Event Identification (1996:122). With Event Identification, Voice combines with the event defined in VP in

Table 1: Semantic types within the Event Model

Node	Type
Voice	<e,<s,t>>
Voice'	<e,<s,t>>
V	<e,<s,t>>
VoiceP	<s,t>
VP	<s,t>
DP	<e>

order to provide the identity of the agent to the sentence. The details of Event Identification are recreated form Kratzer (1996) in (8) using the phrase *feed the dog,* where f=Voice, g=VP, and h=Voice'.

(8) Event Identification

f	g	→	h
<e,<s,t>>	<s,t>		<e,<s,t>>
$\lambda x_e \lambda e_s$ [Agent(x)(e)]	λe_s [feed(the dog)(e)]		$\lambda x_e \lambda e_s$ [Agent(x)(e)&feed(the dog)(e)]

There are now enough methods for combining the nodes semantically. Table 2 outlines the essential nodes, their respective sister nodes, and what method the pairs use to combine (examples of which we will see in the next chapter).

Table 2: Methods of combination of nodes

Node	Sister Node	Combination Method
Voice	VP	Event Identification
Voice'	DP	Function Application
V	DP	Function Application

4. INTERPRETING FULL COPIES

In this chapter I present my solution for interpreting full copies of moved QPs in the semantics interface. In section 4.1, I show how Kratzer's (forthcoming) description of QPs in the Event Model allows them to combine directly with verbs in both subject and object positions. In section 4.2, I present data to show how the proposal from Kratzer (1996) allows full copies of QPs to be interpreted by semantics. In section 4.3, I show how copied QPs in my new model can be interpreted for scope by combining the Scope Principle with other observations of and proposals for scope interpretation.

4.1 How QPs Fit in the New Model

Now that a model exists in which a verb has only one semantic type, we must see if that model will also allow a QP to attach directly to a verb in object position, as desired. According to Kratzer, speaking of the Event Model:

> [T]here is no longer a problem with quantifier phrases in object position. That oldest of all puzzles in logical semantics has quietly disappeared. Subjects and direct objects are now expected to have sister constituents of the same semantic types. . . . No longer can a type mismatch force direct objects to leave their base positions. (Kratzer, forthcoming:1–2)

For that statement to be true, QPs must have a new type that conforms to the Event Model. Kratzer explains that a QP in the Event Model "maps relations between individuals and events into properties of events" (forthcoming:6). In other words, a QP takes an input of <e,<s,t>> and produces an output of <s,t>. This results in the semantic type <<e,<s,t>>,<s,t>> (Kratzer, forthcoming:12).[8] Thus, a QP can combine via Function Application with a verb of type <e,<s,t>> in either subject or object position.

4.2 Examples of QPs in the Event Model

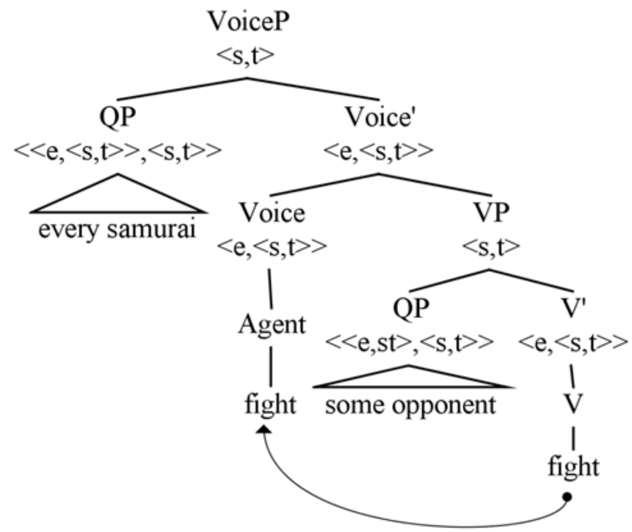
This section contains tree diagrams that extend Kratzer's (1996) Event Model to show how QPs fit into the model. Although I use QPs in the trees, I anticipate that NPs and DPs could replace the QPs in these examples without any difficulty. Two- and three-place predicate constructions are ostensibly of most interest for illustrating how copy theory applies to QPs under the Event Model. I will also show constructions for two types of one-place predicates (unergative and unaccusative), for they both show how the Event Model supports QPs in subject position when the object position is filled. As it also turns out, the unaccusative construction provides the first view of how a QP can be copied and combined directly to the verb in a different position.

4.2.1 Two-Place Predicate

Kratzer (1996) shows the construction of the two-place predicate, so I will illustrate it first using the sentence *every samurai fights some opponent.* In the construction shown in (9), the QP *some opponent* combines with V' via Function Application. V moves to the Voice position. Voice combines with VP via Event Identification. Finally, the QP *every samurai* combines with Voice' via Function Application.

[8] See all of Chapter 2 for the Event Model compatible derivations of QPs and sentences containing them.

(9)



4.2.2 Three-Place Predicate

As addressed in Larson (1988), there are two ways to represent a three-place predicate sentence. One is where the verb takes a DP subject, a DP object, and a PP dative construction as its arguments, such as in *John sent a letter to Mary*. The other is what he refers to as the double-object construction, where the verb takes DPs in all three argument places, such as in *John sent Mary a letter*.

The dative two-place predicate construction is not problematic, as I will show. However, it is not evident from Kratzer (1996) how the Event Model can work with the double-object construction. Important questions crop up in considering that situation. For example, can Voice be used more than once, creating multiple shells for V? If not, are there other heads that could also raise V and allow it to accept more objects?

Kratzer does provide one small clue: she leaves her proposal of Voice's position open to the "possibility . . . that there are intervening inflectional heads [between V and Voice]" (1996:126). Pylkkänen (2002) proposes what some of these heads could be, how they are positioned in constructions according to the Event Model, and how they can yield double-object constructions.

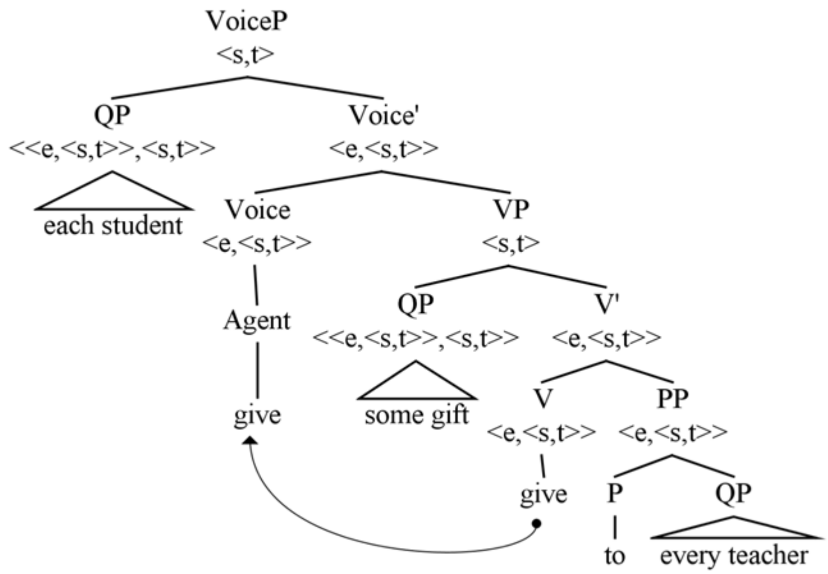
The actual nature of an indirect object is still a topic of discussion. Since it is not the intent of this paper to analyze and propose a solution to the double-object construction, I will only provide a tree diagram for the three-place predicate construction that contains a dative construction as one of its objects, as presented in Larson (1988). In this construction, the indirect object is embedded within a prepositional phrase (PP) with *to* as its head. It is necessary, therefore, to modify the semantic type for PP to fit the Event Model. Currently, PP is regarded as being of type <e,t>. This type parallels the <e,t> type for verbs, so I will assign PP the new type <e,<s,t>>, which will allow it to combine with the a verb of type <e,<s,t>> using Predicate Modification, an existing semantic method for combining nodes.

This three-place predicate construction is illustrated in (10), using the sentence *each student gave some gift to every teacher.* The PP *to every teacher* combines with V via Predicate Modification. The QP *some gift* combines with V' via Function Application. V moves to the Voice position. Voice combines with VP via Event Identification. Last, the QP *each student* combines with Voice' via Function Application.

4.2.3 One-Place Predicate (Unergative)

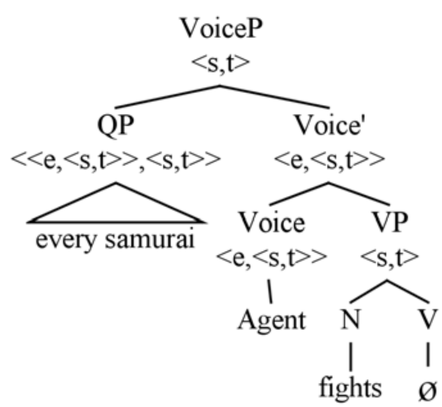
The one-place predicate construction for an unergative verb does not involve V Raising within the shell. Since the verb does not have an object, VP is ready for combination with Voice.

(10)



For the one-place structure I adapt the Hale and Keyser (1993) model for unergative structures: VP is the result of a noun that has combined with a null verb, and is of the resulting type <s,t>. This creates the structure shown in (11), using the sentence *every samurai fights*. Voice combines with VP via Event Identification. The QP *every samurai* combines with Voice' via Function Application.

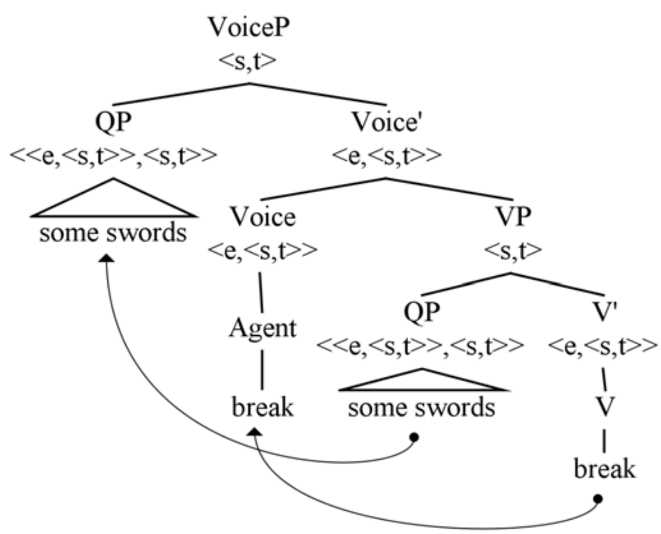
(11)



4.2.4 One-Place Predicate (Unaccusative)

The one-place predicate construction for an unaccusative verb looks similar to the two-place predicate construction. The difference is that the subject of the sentence is actually internal but is motivated to move Spec-VoiceP to check off features. The sentence *some swords break* is illustrated in (12). The QP *some swords* combines with V via Function Application. V moves to the Voice position. Voice combines with VP via Event Identification. The QP *some swords* moves to the Spec-VoiceP position and combines directly with Voice' via Function Application.

(12)



This particular tree reveals the crucial fact that within the Voice structure there is *no problem with creating a copy of QP* and that the copy can combine with a node in a new position *without being converted to a trace.*

4.3 No More Traces

We now have a model in which QPs in object position can combine directly with verbs, and I have shown in the new model that a QP can copy, move, and combine via simple Function Application to a new node. The need for traces in semantic interpretation of QPs vanishes. How does this look for the two- and three-place predicate constructions? Though movement is not required in these cases to satisfy the Voice structure, the QPs in these constructions will move in the syntax in order to check off any remaining features.

Movement of QPs to positions outside of the VP shell is in harmony with the Event Model. Kratzer stated that movement of constituents can continue in a tree until, as she puts it, the "Event Argument is existentially quantified" (1996:125–126). As mentioned above, she admits the possibility that intervening heads exist, and even that they could be "all of Tense, . . . Mood, and Aspect" (Kratzer 1996:126).[9] Thus, for the sentence *every samurai fights some opponent,* a tree like that shown in (13)[10] is possible, where each position of the movement chain contains a full copy of the moved QP. This allows MP to remain minimalistic, not performing any extra operations such as Trace Conversion to satisfy the semantic interface.

4.4 Interpreting Scope

When traces disappear, so does any necessity for QR. How, then, can scope be interpreted? The QR model gave a clear indication of which argument had wide scope and which had narrow scope and that the head of the movement chain was the scope-

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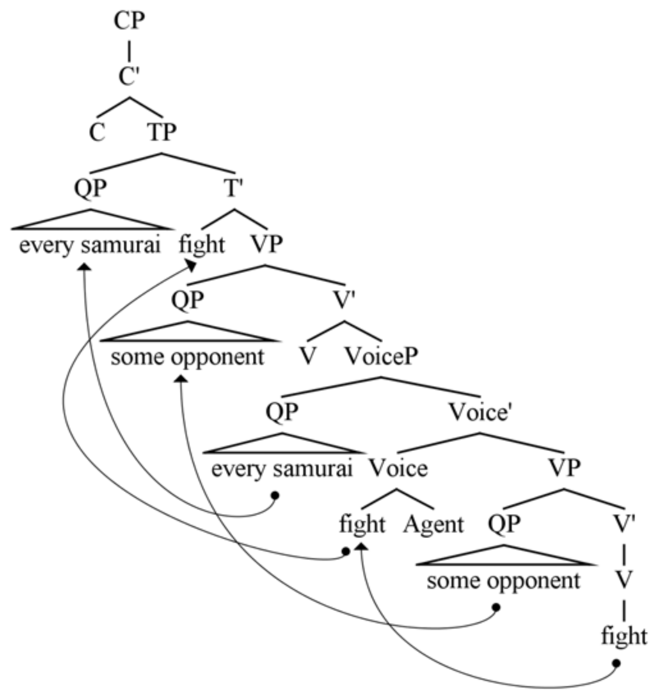
[9] I will not attempt to derive the semantic types for those intervening heads, but simply assume that QP and V can continue to directly combine with them directly, as they do with other nodes in the Voice structure. For treatment of intervening heads and their potential types, see Pylkkänen (2002).

[10] In accordance with Chomsky 2000:4, I move the lower QP into another VP above VoiceP.

bearing element (for example, in (13), *every samurai* would bear wide scope). That is no longer as obvious.

(13)



As was stated previously, Aoun and Li (1989) discovered that, to be interpreted for wide scope, the head of a movement chain does not need to occupy a higher position in the syntactic tree with respect to the head of a second chain (as it would in a QR model). The Scope Principle (Aoun and Li 1989, 1993) states that one QP may hold wide scope over another as long as it c-commands a member of the other QP's movement chain. In addition, Fox (1999a) reveals that QPs can also hold scope in their base position rather than at the head position. These pieces of information create two questions: first, what determines which QP gains wide scope; second, which copy in the chain actually bears scope?

In answer to the first question, I will assume the position set by Fox (1995, 1999b, 2002), that the syntactic rules for movement and binding place restrictions on which QP can have wide scope. Takahashi (2006:16) supports this claim: "[T]he scope of QPs is structurally represented in *syntactic* representations [called LFs]" (emphasis mine; strong evidence for this proposal also appears in Aoun and Li (1989).)

The answer to the second question also lies in the syntax. Takahashi (2006) gives a simple solution that is in full harmony with MP: "delete" the copies that should not be interpreted. This is a practice already in place for PF. According to Chomsky (1993), members of movement chains may be deleted (that is, made invisible to interpretation) when they are sent to PF, and the result is that they are not phonologically realized. We can perform a similar action on QPs when LF is sent to the semantic interface, which would make them visible to the semantic component but uninterpretable for scope.

Putting together Aoun's and Li's Scope Principle, Fox's observations, and Takahashi's proposal to delete copies yields what I will call the Scope Interpretation Rule, which is formalized in (14).

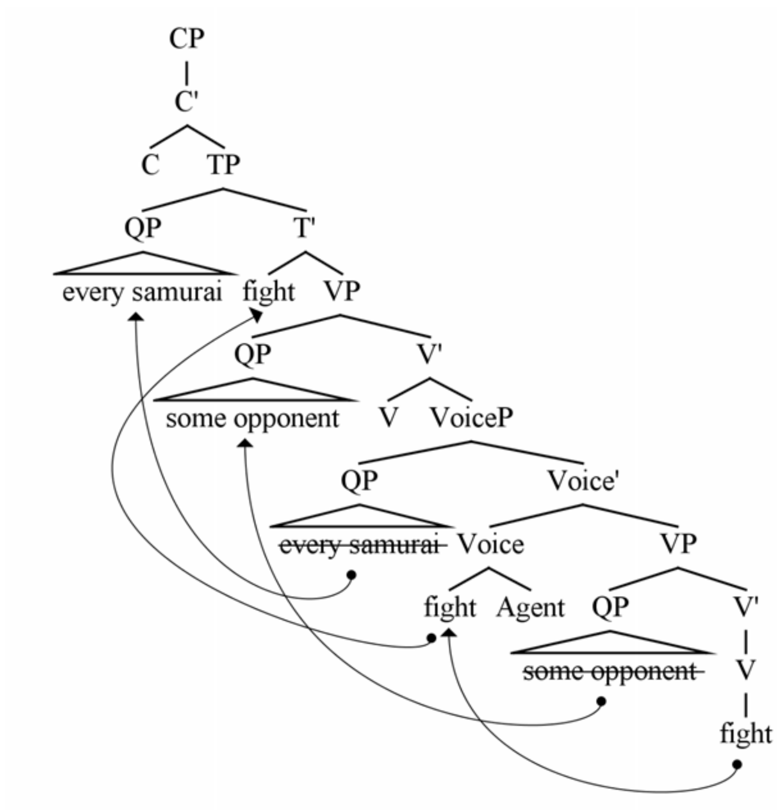
(14) Scope Interpretation Rule

The semantic interface interprets the scope of QPs in LF according to the following conditions:

i. Restrictions on scope reconstruction are determined in the syntax interface.
ii. Only one copy in a chain may bear scope. Copies of QPs that do not bear scope are "deleted" in the LF, meaning that they retain their semantic type but are uninterpretable for scope to the semantic interface.
iii. The interpretable QP that holds wide scope must c-command at least one interpretable copy from each of the other copy chains that contain a scope bearing element.

Let us apply the Scope Interpretation Rule to (15). In (15), the QP *every samurai* occupies a higher final position in the tree than the QP *some opponent.* In a QR model, such a position would entitle *every samurai* to have wide scope. However, according to part iii of the Scope Interpretation Rule, since *some opponent* c-commands the copy of *every samurai* in Spec-VoiceP, *some opponent* can instead hold wide scope without occupying the highest position (assuming, according to part i, that the syntax allows such a scope reconstruction). The semantic types of the deleted copies remain the same (according to part ii), so there is no need to adjust the rules by which they combine to their respective sister nodes.

(15)



5. CONCLUSION AND IDEAS FOR FURTHER RESEARCH

5.1 Conclusion

In this paper I proposed that the semantic interface should be able to interpret full copies of QPs received from LF. After establishing the problem of type mismatch between verbs and QPs in traditional semantics, I proposed that since QPs had a firmly established semantic type, it was logical to consider reducing the semantic type of verbs from three types to one. For this to be possible, verbs would have to be able to move in the syntactic tree so that they could combine with more than one argument. VP shells provided a syntactic structure where this was possible.

Kratzer (1996) created a semantic model that assigned verbs just one semantic type and proposed a structure that was a fitting counterpart to VP shells in syntax. I expanded this model to include QPs, and I demonstrated how QPs could combine with verbs both in subject and object positions. I then showed that in the new Event Model QPs could move and leave full copies with no type conflicts.

Finally, I combined aspects of Aoun and Li's (1989) Scope Principle, Fox's (1999a) observation that any member of a movement chain can bear scope, and Takahashi's (2006) proposal that copies of QPs can be rendered invisible to scope interpretation in LF, and created the Scope Interpretation Rule. The Scope Interpretation Rule states that the syntax will restrict and determine scope, that copies of QPs that do not bear scope are “deleted” from scope interpretation, and that the semantics interface only interprets scope for the “visible” copies.

5.2 For Further Research

Below are items that I suggest for future research, either because they were beyond the scope of this paper or because this paper creates the necessity.

- Intervening heads in the Event Model: Pylkkänen (2002) has performed some research on what heads interact with Voice. More research would help determine the exact semantic types of all those heads, how they combine with QPs, and whether or not they include such heads as Tense, Agr, and Mood (as suggested by Kratzer (1996)).
- Double-object constructions with QPs in the Event Model: Pylkkänen (2002) does address double-object construction in the Event Model, but more research is needed to define a construction that is suitable for QPs in that model.
- Cross-linguistic analysis: Research that applies the Event Model with copies of QPs and the Scope Interpretation Rule to languages other than English can help verify the proposals of this paper or provide information that can help refine them.

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