QUESTIONS AND QUANTIFIERS
An Inquiry in Natural Language Metaphysics
Résumé

Cette thèse traite des questions quantifiées (QQs) et, plus spécifiquement, de trois phénomènes : « Pair-List Readings » (PLRs), « Weak Islands » (WIs) et « Intervention Effects » (IEs). Nous observons que, dans plusieurs cas, il existe contraintes sur l’interprétation des QQs qui s’avèrent purement linguistiques. Par exemple, ni la logique ni la pragmatique n’empêche de répondre à la question *Who did few girls see?* par l’usage d’une « pair list »; néanmoins, on ne le ferait pas spontanément. La question fondamentale qui sous-tend cette thèse est la suivante : quelles présuppositions ontologiques soutiennent le mieux une sémantique explicite des langues naturelles? Cette recherche contribue à l’ensemble de preuves que la langue naturelle quantifie sur au moins deux domaines, celui des individus et celui des événements. Nous avons conçu une méthode novatrice pour tester les intuitions des locuteurs quant aux « conditions de réponse » des questions. Elle nous a permis de constater que des phrases interrogatives quantifiées peuvent être ambigües et avoir a la fois une lecture dite « d’objet » et une autre dite « d’événement ». Nous démontrons que les conditions de vérité de la réponse PL à une QQ sont celles de sa lecture événement. Nous postulons est que les possibilités d’interprétation d’une QQ dépendent de l’interaction des valeurs de deux paramètres : le domaine de quantification, (celui des événements ou celui des individus, E or D) et le type sémantique de la phrase sujet, (référentiel ou quantificatif, <d> ou <<dt>t>). Une lecture PL résulte de la combinaison *[E,<d>]. Les WIs se produisent de la combinaison *[E,<<dt>t>]. Nous avançons l’hypothèse que les langues naturelles ne génèrent pas cette combinaison, et qu’elle est exclue à cause d’un « type mismatch ». Les combinaisons [D,<d>] et [D,<<dt>t>] donnent lieu toutes les deux a une lecture « objet ». Les IEs sont dus à la combinaison de celle-ci avec un autre élément (« WH-AGENT ») qui s’interpose. Nous proposons deux alternatives pour la sémantique des QQs. La première est algébrique et emploie des « alternative sets »; la deuxième est dynamique. Ici, nous suggérons que l’opérateur interrogatif, Q, fonctionne à la manière d’un quantificateur adverbiaal comme *généralement* ou *toujours*. Cette approche permet un traitement plus uniforme des phrases déclaratives et interrogatives et elle contribue à l’unification de la sémantique des expressions nominales et verbales.
Abstract

This dissertation looks at quantified questions (“QQs”) and, specifically, at Pair-List readings, Weak Islands and Intervention Effects (“PLRs,” “WIs” and “IEs”). In many cases, we observe that there are constraints on the interpretation of QQs that are irreducibly linguistic. Although no logical or pragmatic constraint precludes understanding, say, *Who did few girls see?* as a request for a pair-list, that interpretation is unavailable. The “big question” that structures this project is: What ontological presuppositions best support an explicit semantics for natural language? We contribute to the growing body of evidence that natural language quantifies over at least two basic domains, viz., individuals and events. We develop a somewhat novel method of testing speakers’ intuitions with regard to the “answerhood conditions” of questions. We found, first, that some quantified interrogatives can be ambiguous between an object- and an event-related reading. The truth conditions of the PL response to a quantified question are those of its event-related reading. The truth conditions of responses to non-quantified *in-situ* questions are also those of the event-related reading; the truth conditions of responses to raised quantified questions are those of the object-related reading. We hypothesize that the interpretive possibilities in QQs are a function of the values of two parameters: the domain being quantified over (events or individuals, E or D) and the type of the subject phrase (referential or quantificational, <d> or <<dt>t>). A PL reading results from the combination [E,<d>]. WIs are the product of the “combination” *[[E,<<dt>t>]]. We hypothesize that there are no extant examples of this combination in natural language – a type mismatch precludes it. Both the combinations [D,<d>] and [D,<<dt>t>] yield object-related readings. IEs result from the combination of the combination [D,<<dt>t>] and an intervener, “WH-AGENT.” We develop two proposals for the semantics of QQs. The first is algebraic and makes use of “alternative sets.” The second is dynamic. Here, the question operator, Q, is treated like an adverbial quantifier of the ilk of *usually* or *always*. This approach permits a more uniform treatment of the semantics of nominal and verbal expressions and of declaratives and interrogatives.
Acknowledgements

I have received a great deal of help in the course of the two years it took to finish this project. I am very grateful to Manuel Español-Echevarría, who read the entire manuscript more than once, saving me from many, many errors I would have regretted. Bernhard Schwarz also pointed out mistakes and made me aware of many points that were lacking in clarity. I am very grateful, too, to Donka Farkas and, indeed, to everyone associated with the Linguistics Research Center at the University of California at Santa Cruz. The LRC provided me with a warm home away from home in the fall of 2006 and the spring of 2007. My advisor, Claudia Borgonovo, showed me unearned confidence. I am very grateful to her for securing me the space and time I needed to explore questions that were new and strange to both of us. I received a research grant from the Département de langues, linguistique et traduction at Université Laval and a fieldwork grant from the Bureau international, also at Université Laval. The Linguistics Department at McGill University welcomed me as an exchange student in the winter of 2005; in the summer of 2005, thanks to a tuition fellowship from the Linguistic Society of America, I attended the Summer Institute at MIT. These experiences provided me with tools that proved indispensable. Finally, I am grateful to my father for unwavering support in this and all my endeavors: it is to him that I dedicate this flimsy folio.

In December 1999, I abandoned life in the academy in California and headed into the snow-covered wilderness of the Gaspésie (Quebec). I never expected to retrace my steps back south and west. For better or worse, this project brought me out of the woods and returned me to the society of learning. Like all projects in formal linguistics, this one attempts to explain how exactly it is that we make sense of certain strings of noise, why exactly it is that certain sequences of sounds have the effect (power) they do. In contrast, my project there in the Gaspésie inquired into the sense of silence. At some point during that first long winter, when my ears had stopped ringing with memory of electricity, I wrote this:

    silence was
    that feathered birds
    and brought mountains
    to their halt
Devi, imagine the Sanskrit letters in these honey-filled foci of awareness, first as letters, then more subtly as sounds, then as most subtle feeling. Then, leaving them aside, be free.
# Table des matières

Résumé.................................................................................................................................i
Abstract.................................................................................................................................. ii
Acknowledgements............................................................................................................... iii
Table des matières ..................................................................................................................v
Introduction.............................................................................................................................1
Chapter 1. Questions and Quantifiers .....................................................................................3
   Phenomena under investigation..........................................................................................3
      Pair List Readings...........................................................................................................3
      Weak Islands.................................................................................................................4
   Intervention Effects.........................................................................................................5
The data.....................................................................................................................................8
   Pair-List Readings.............................................................................................................8
   Weak Islands....................................................................................................................10
   Intervention Effects.......................................................................................................11
   Proposed analysis...........................................................................................................14
      PLRs..............................................................................................................................16
      A unified analysis .......................................................................................................20
   Summary of Chapter 1......................................................................................................22
Chapter 2. Foundations........................................................................................................... 24
   Questions ..........................................................................................................................24
   Natural language quantification.......................................................................................28
      Modals ..........................................................................................................................30
      Adverbs .........................................................................................................................31
      Question words .............................................................................................................32
   Event semantics ................................................................................................................33
   Ontology ............................................................................................................................36
      Individuals and sets......................................................................................................37
      Sums...............................................................................................................................37
      Groups...........................................................................................................................39
      An extension to the domain of events..........................................................................40
   Dynamic semantics ..........................................................................................................42
   Summary of Chapter 2......................................................................................................47
Chapter 3. Pair List Readings ...............................................................................................51
   Overview...........................................................................................................................51
   Extant analyses ...............................................................................................................52
      Engdahl: Quantification over functions ......................................................................54
      Groenendijk and Stokhoff: quantification over a subexpression.................................55
      Karttunen: quantification over a super-expression.......................................................56
      Chierchia: Weak crossover and witness sets ...............................................................57
      Szabolcsi: PLRs in the complements of extensional predicates ...................................62
      Krifka: PLRs as conjoined questions acts.................................................................63
      Barss, Dayal, Hagstrom: Interrogative quantification over existential CFs ..................67
      Lahiri: A Boolean algebra for answers .......................................................................69
Introduction

Barbara Partee opens her 1990 paper “Adverbial quantification and event structures” with these lines: “The issues will be addressed in the spirit of what Emmon Bach (1986) calls ‘natural language metaphysics,’ as an inquiry into what ontological presuppositions best support an explicit semantics for natural language which characterizes truth conditions and entailment relations.” We have undertaken this project in the same spirit. In this thesis we contribute to the growing body of evidence that natural language quantifies over at least two basic domains, viz., individuals and events. We propose a semantics for quantification over these two domains that accounts for some heretofore mysterious interpretive gaps. We focus on quantified questions (QQs) and, specifically, on three phenomena, Pair-List readings, Weak Islands and Intervention Effects (hereafter, PLRs, WIs and IEs), offering a unified account of the three. We found that the interpretability and interpretive possibilities in QQs are a function of the values of two parameters: the domain being quantified over (events or individuals, E or D) and the type of the subject phrase (referential or quantificational, <d> or <<dt>t>) (Table I).

Table I: DP type by domain of quantification

<table>
<thead>
<tr>
<th>Domain of Quantification</th>
<th>REFERENTIAL: &lt;d&gt;</th>
<th>QUANTITATIVE: &lt;&lt;dt&gt;t&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDIVIDUALS: D</td>
<td>Individual Reading</td>
<td>Intervention Effects</td>
</tr>
<tr>
<td>EVENTS: E</td>
<td>Pair List Reading</td>
<td>Weak Islands</td>
</tr>
</tbody>
</table>

Our approach permits a more uniform treatment of the semantics of nominal and verbal expressions and of declaratives and interrogatives.

This thesis is organized as follows. In chapter I we give an account of the phenomena under investigation and we offer a summary of our analysis. In chapter II we make explicit our theoretical assumptions and we summarize the relevant literature. Specifically, we review recent work in the areas of event semantics, nominal ontology, quantification, and dynamic semantics. Chapters III-V examine PLRs, WIs and IEs in turn. These chapters
follow a common pattern: they begin with a brief recapitulation of the data and proceed to a review of the literature; our analysis is then presented in detail.
Chapter 1. Questions and Quantifiers

(1a, b and c) supply examples of quantified questions (hereafter, QQs) in English.

1. a. What did every witness notice?
   b. How did the three slayers kill the vampires?
   c. Where did no girl but May go?

It turns out that QQs can be a bit “quirky.” “Pair-List Readings,” “Weak Islands,” and “Intervention Effects” are the names that have been assigned to three of these quirks. In what follows we offer a unified account of the three. The exercise, we believe, ultimately reveals a good deal about the building blocks and architecture of human language.

This chapter is organized as follows. In this section we give a colloquial account of the phenomena under investigation. In section II we give a more formal account and supply more data. In section III we summarize our analysis.

Phenomena under investigation

Pair List Readings
Questions with quantifiers are often many-ways ambiguous. Questions like Who did every girl see? and Who did the three girls see? have three answer types, individual (“Angela”), functional (“Her best friend”) and pair-list (“Anne saw Barbara; Carol saw Dolores; and Elizabeth saw Francine”).

2. a. Who did every girl see?
   b. Who did the three girls see?
   c. Answer 1 (individual): Angela
   e. Answer 3 (pair-list): Anne saw Barbara; Carolyn saw Dolores; Elizabeth saw . . .
We can understand the pair-list answer to questions like those in (2) as responding to a request of the form in (3):

3. Make me a list of Q-many girls (or Q-proportion of some set of girls) and tell me who they each saw.

The principal empirical puzzle with regard to PLRs is why they are available with some quantifiers but not with others. Consider (4), where every and the three have been replaced by many and no. Here, although it is still possible to answer by naming an individual or a relation, the pair-list answer is no longer felicitous (“%” indicates an infelicitous response).

4. a. Who did many girls see?
   b. Who did no girl see?
   c. Angela.
   d. Their best friends/Her best friend.
   e. % Anne saw Barbara; Carolyn saw Dolores; Elizabeth . . .
      % Anne didn’t see Barbara, Carolyn didn’t see . . .

It seems that it is not possible to put the elements of (4a) or (4b) into the frame in (3). We cannot interpret (4a) as a request to draw up a list of many girls and name whom they saw. Nor can we interpret (4b) as a request to draw up a list of all the girls and name who they didn’t see. It is not that we cannot understand such requests. We can. Nor is it that they refer to impossible states of affairs. They don’t. No logical or pragmatic constraint precludes understanding either (4a) or (4b) as a request for a pair-list. Nonetheless, the interpretation is not available. Human language “doesn’t go there.” The constraint is irreducibly linguistic.

**Weak Islands**

Compare (5) and (6). (“#” indicates that the sentence, although grammatical, is uninterpretable.)
5.  a.  **What** did **few girls** see?
   
   b.  #**How** did **few girls** get to school?

(5a) is a readily-interpretable, naturally-occurring sentence: *What thing x is such that few girls saw x?* Now, if we squint and tilt our heads we can understand (5b) analogously: *What manner m is such that few girls got to school m?* (5b), however, does not occur naturally: speakers do not spontaneously produce questions of this shape. Think of it like this. If we were ever to see a cat with four tails we would probably be able to identify it as a cat with four tails. But nature will not present us with any such creature. Similarly, we can parse (5b), but we needn’t fear that, outside the confines of a formal-linguistics exercise, we will ever trip over anything like it.

Again, neither mathematics nor physics is at issue. (5b) has a first-order logical representation. And our world might very well confront us with situations in which the question of what mode of transportation was employed by some proportion of girls would be relevant.¹ But, again, human language “won’t go there.”

**Intervention Effects**

Languages of the world differ in terms of what they do with question words. Some languages, like English, “promote” question words, as the examples in (6) show (“__” indicates the base position of the question word; the base position is the canonical position for the corresponding answer word(s) ) (Richards 2002: ch.1).

6.  a.  **What** did you do __ this weekend?

   b.  **Why** did you go all the way to Moss Landing to surf __ if the waves are just as good at Davenport?

   c.  **When** will you ever finish your dissertation __?

Other languages, like Chinese, leave question words “*in situ*” (in their base position).

¹ Imagine that you are a school district official and you are trying to promote physical activity. You have just done a survey of the various schools in your district to try to determine what proportion of students got to school by bus, and what proportion on foot, etc.
7. a. hufei mail-le **shenme** (ne) (Mandarin, Cheng & Rooryck: 2)
    Hufei buy-PERF what PRT
    “What did Hufei buy?”

    b. hufei xihuan nei-**ben** xie de shu (Mandarin, C&R: 3)
    Hufei like that-CL-who write DE book
    “Who is the person x such that Hufei likes the book that x wrote?”

    c. Minsu-nun **nuku-lûl** po-ass-ni? (Korean, Beck 2006:3)
    Minsu-TOP who-ACC see-PAST-Q
    “Who did Minsu see?”

Some languages do both.² French is one of these languages. In (8a) the question-word **qui** (“who”) has been raised, while in (8b) **qui** remains *in situ*. Both (8a) and (8b) are perfectly grammatical. Moreover, they are synonymous: both translate the English *Who did you see?*

8. a. Tu as vu **qui**?
    You have seen who
    “Who did you see?”

    b. **Qui** est-ce que tu as vu?
    Who is-it that you have seen
    "Who did you see?"

The sentences in (9a) and (9b) form minimal pairs with those in (8a) and (8b) respectively.

² In questions with two or more *wh*-words, English raises only one, leaving the other *in situ*, as in (i).

(i) a. **Who** did you meet **where**?
    b. **What** did she say to **whom**?

Languages like Hungarian raise both (cf. Richards 2001).
In (9), a quantifier, *tout le monde* ("everyone"), replaces the pronoun, *tu* ("you") of (8).

9. a. *Tout le monde* a vu *qui*
   Everyone has seen who
   "Who did everyone see?"

   b. *Qui* est-ce que *tout le monde* a vu?
   Who is-it that everyone has seen?
   "Who did everyone see?"

Only the question-word-initial (hereafter "raised" or "fronted") variant is grammatical ("*" indicates that the sentence is ungrammatical). In French, a question like (8a) *Tu a vu qui?* ("Who did you see?") is perfectly grammatical. Replace the pronoun with a quantifier, as in (9a), however, and the question is ill-formed: *Tout le monde a vu qui?* ("Who did everyone see?"). This phenomenon is often attributed to Intervention Effects (IEs). Critically, IEs in French only arise where the question word has been left *in-situ*. (9b), the *qu*-fronted variant of the ungrammatical (9a), *Qui est-ce que tout le monde a vu?* ("Who did everyone see?"), is fine.

Second-language (L2) speakers of French whose first language is English and Spanish have no trouble interpreting (9b). They go from *You have seen who?* to *Everyone has seen who?* without any sense that something terrible is going on. Native speakers of French vehemently reject (9b), however. Most exclude it as ungrammatical: "On ne dit pas ça," (People don't say that). Some actually reject it as nonsense: "Ça manque de sens," (That doesn't make sense). And (10), where the positive universal *tout le monde* ("everyone") of (9a), is replaced by the negative universal *personne* ("no one"), is systematically rejected as uninterpretable.

10. *Personne* n’ a vu *qui?*
    No one NEG has seen who
    "Who did no one see?"
The mystery here is that what *Personne n'a vu qui?* might mean makes sense: What person x is such that no one saw x? But *Personne n'a vu qui?* doesn't in fact mean anything: it "does not compute" and it is not attested in natural language. Here again, we have found a place where our minds might go but where language won’t take us.

**The data**

PLRs, WIs and IEs are the names of three phenomena that result when quantifiers are introduced into question sentences. The study of the three together promises to teach us something about the building blocks and architecture of human language. In this section we describe the three phenomena a little more formally and in a little more detail.

**Pair-List Readings**

Questions with quantifiers can be ambiguous. (11a), for example, admits three different kinds of responses – individual, functional and pair-list. In the first case, answers take the form of (11b) and name a single individual. In the second case, answers name a relation: they specify a function that associates each member of the subject set with some (possibly different) member of the object set, as in (11c). Finally, in the case of the pair-list reading, (11d), answers match members of the subject and object sets, enumerating them two-by-two.

11. a. What did *every* girl see?
   
   b. Individual: "*Happy Together.*"
   
   c. Functional: "*Her favorite film.*"

---

3 A Google search for the exact phrase “Tout le monde a vu qui?” returns only strings in which *qui* has a different grammatical role, as in (ia), or belongs to a different syntactic structure as in (ib).

(i) a. Nous sommes leaders, et *tout le monde a vu qui* a le mieux joué et qui a gagné le plus de matchs, et obtenu le plus de points.
   <www.fc-barcelone.com/articlesavril2605.htm>

   b. *Tout le monde a vu *"Qui* veut gagner des millions?" au moins une fois. <dianoueintheus.travelblog.fr/243416/The-clicker/>
d. Pair-list: “Anne saw Todo sobre mi madre, Beatrice saw Mala educación and Carmen saw Volver.

The first challenge in the analysis of PLRs is simply to supply a representation for each (all) of these answer-types. The second is to explain the “chimeral” behavior of PLRs. PL readings have a much more restricted distribution than do functional readings or individual readings. Unlike the natural function reading and the individual reading, the pair-list reading is not compatible with negation, and, indeed, it disappears in all downward-monotone contexts. Thus, while (12b and c) are perfectly natural responses to (12a), (12d) is infelicitous.

12. a. Who does no man love?
   b. Angela
   c. The girl who dumped him with no explanation.
   d. % Abe does not love Barbara, Carl does not love Delores, . . .

In fact, while natural-function readings are supported by a range of quantifiers, it seems that only every and each support a pair-list reading.

13. a. Who do most/several/few/(more than) two men love?

(ia) is not a question. Here qui is a relative pronoun, the head of the subordinate clause qui a le mieux joué (“who played the best”). In (ib) qui parses with the embedded question, Qui veut gagner des millions? (“Who wants to win millions?”)

4 A determiner D can be downward monotone with respect to either its left or right argument. D is left downward monotone if \([s_{1}[NP D DP] VP]\) entails \([s_{2}[NP D DP'] VP]\) where DP' denotes a subset of the set denoted by DP (Lexicon of Linguistics). For example in (i), DP', girls with visible tattoos who practice yoga with me is a subset of DP, girls who practice yoga; the D, at most two is downward monotone, and \(S_1\) indeed entails \(S_2\). Compare (ia) to (ib) where at most two has been replaced with at least two, which is not downward monotone. In (ib) \(S_1\) does not entail \(S_2\).

(i) a. \([s_1At most two girls who practice yoga can do eka pada raja kapotasana (one-legged king pidgeon pose)]\) therefore \([s_2at most two girls with visible tattoos who practice yoga with me can do eka pada raja kapotasana (one-legged king pidgeon pose)]\).

b. \(#[s_1At least two girls who practice yoga can do eka pada raja kapotasana (one-legged king pidgeon pose)]\) therefore \([s_2at least two girls with visible tattoos who practice yoga with me can do eka pada raja kapotasana (one-legged king pidgeon pose)]\).
b. **Few/most/several/(more than) two men** love their sister.

c. % Abe loves Barbara, Carl loves Delores . . .

PL readings with non-universal quantifiers are available however, when the question figures as the complement of an extensional verb like *find out*. Szabolcsi (1996) observed that while PLRs with non-universal quantifiers are not available in matrix questions nor in the complement of intensional (*wonder*-type) verbs, they are available in the complement of extensional (*find out*-class) verbs, as (14) and (15) show.

14. a. Jane **wonders** what **several** girls saw.
   b. %Jane **wonders** if Alice saw *Amores Perros* and if Beatrice saw *Invasiones Barbares* and if Carmen saw *Chung King Express*.

15. a. Jane **found out** what **several** girls saw.
   b. Jane **found out** that Alice saw *Amores Perros*, Beatrice saw *Invasiones Barbares* and Carmen saw *Chung King Express*.

**Weak Islands**

Weak Islands (WIs) are selectively permeable to *wh*-Ps: they permit the extraction of some (*what, who*) but not others (*how, why*). In (16) the *wh*-phrases *which man* and *how* are extracted from their base position over *not*. In the case of the *which*-P the result is grammatical; in the case of the *how*-P it isn’t.

16. a. **Which** book didn’t you read __?
   b. *How didn’t you fix the car __?

(17) and (18) supply further examples of WI violations. (17b) is usually diagnosed as a “scope island” violation; (18b) as a “*wh*-island” violation.

17. a. **Which** teacher did **more/fewer than five** students invite?
   b. *How did **more/fewer than five** students behave? (Honcoop 1998:4)
18. a. **Which** man are you wondering **whether** to invite __?
   b. *How are you wondering **whether** to behave __? (Honcoop 1998:3)

Presuppositional verbs are also said to create WIs. Factive verbs like *regret, know* and *realize* as well as others like *deny* and *agree* presuppose the truth of their complement clause. As (19) shows, it is possible to extract a *which*-P but not a *how*-P over a verb in this class.

19. a. **Which** man do you *regret/ know/ realize* that I invited __?
   b. *How* do you *regret/ know/ realize* that I behaved __?
   (Honcoop 1998:4-5)

**Intervention Effects**

(20) and (21) are examples of Intervention Effects (IEs): grammatical questions are rendered ungrammatical by the introduction of operators like *only* and *not*.

20. a. Did Peter invite Maria or Susanne?
   b. *Did only Peter invite Maria or Susanne?

21. a. Which diplomat should I discuss which issue with __?
   b. ??Which diplomat should I *not* discuss which issue with __?

In English, IEs are not very common. They do occur, however, in **yes-no** and alternative

---

5 To convince yourself that *deny* is properly classed as presuppositional compare (ic) with (ia) and (ib). The verb in (a), *say*, is not factive, the verb in (b), *know*, is. In (a) James may say he is the murderer just like he may say he is a unicorn or a Martian. He says he is, and for all we know he might be, but his saying it doesn’t introduce any presupposition that it is true. Thus, the second conjoint, *but he is not the murderer*, does not contradict the first. In (b), in contrast, a presupposition attaches to the complement in the first conjunct – James is the murderer. James may not know that he is the murderer but his ignorance has no bearing on the fact, presupposed, that he is. The second conjunct, *but he is not the murderer*, contradicts this presupposition and the sentence is awkward. (c) seems to pattern with (b) and not with (a) in this regard.

(i) a. James says that he is the murderer, but he is not the murderer.
   b. %James doesn’t know that he is the murderer, but he is not the murderer.
   c. %James denies that he is the murderer, but he is not the murderer.
questions like (20) and in sentences, like (21), which otherwise permissibly violate superiority.6,7

IEs are more common in French, where a question word may either be raised as in (22a) or left in-situ, as in (22b). (Here I borrow my examples from the work of other scholars.

---

6 IEs may also occur in sentences with Negative Polarity Items (NPIs) (Szabolcsi, 2004; Guerzoni, ms, as cited in Beck, 2006). Here it is not necessarily grammaticality that is at issue but the availability of different scope configurations. (i), for example, cannot be interpreted to mean that it is not the case that at every party Mary wore the same earrings (i.e. it cannot be interpreted with the scope order Not>every>any).

(i) Mary didn’t wear any earrings to every party.

7 Theoretically, in a language like English in which only one wh-word raises, in sentences where both the subject and the object are questioned, either the subject or the object term might raise. Nevertheless, in general only the first option yields a grammatical utterance, as the contrast in (ii) demonstrates.

(ii) a. Who __ saw what?
    b. *What did who see __?

That said, it has been remarked that these Superiority effects do not survive if the monomorphemic what is replaced by the complex which+N. Thus, while (iiic) is perfectly fine the sentence is markedly degraded once not is introduced, as (iiid) shows.

(iii) a. Who read what?
    b. *What did who read?
    c. Which book did which man read?
    d. ??Which book didn’t which man read?

According to Pesetsky (1987) at issue is whether the wh-word refers to a given set of entities in the utterance context, that is, whether it is D(iscourse)-linked. Which-Ps, it is argued, are inherently D-linked, while monomorphemic wh-expressions may be D-linked given appropriate contextual support, as in (iv).

(iv) I know what just about everyone was asked to do, but what did who (actually) do?

Pesetsky (1987) hypothesizes that non-D-linked phrases are assigned scope via movement while D-linked phrases are bound by an unselective Q-operator. Thus, the LF corresponding to *What did who read? would be (iib’), while the LF corresponding to Which book did which man read? would resemble (iic’), where Q binds which man in-situ.

(ii) b’ *[i, who, what, [t, read tj]]
    c’ [Q, which book, [which man, read tj]]

In Pesetsky (2000) this is reconceptualized in terms of feature movement. He hypothesizes that while overt and covert movement are constrained by superiority, feature movement is not.
notably Boeckx, (1999), Chang (1997), Mathieu (2003) and Zubizaretta (n.d.). My own fieldwork in Quebec largely confirms the judgements these authors report.)

22. a. **Qui** ont-ils rencontré?
   Who have-they met
   “Who did they meet?”

   b. Ils ont rencontré **qui**?
   They have met who
   “Who did they meet?”

Crucially, in French, IEs only manifest themselves in in-situ questions, as the contrasts in (23) and (24) attest.8

23. a. **Qui** est-ce que seulement Marie a vu?
   Who is-it that only Marie has seen
   “Who did only Mary see?”

   b. *Seulement Marie a vu **qui**?
   only Marie has seen who
   “Who did only Mary see?”

24. a. **Qui** n’ont-ils pas rencontré?
   Who N have-they not met
   “Who didn’t they meet?”

---

8 Manuel Español-Echevarría (p.c.) points out that French “aggressively non D-linked” *wh*-words cannot stay *in situ*, as the contrast between (ia) and (ib) shows.

(i) a. *Il va où diable?
   He goes where devil
   “Where the hell is he going?”

   b. *Où diable va-t-il?*
   Where devil goes-T-he
b. *Ils n’ ont pas rencontré qui?
   They N have not met who
   “Who didn’t they meet?”

Beck (2006) documents IEs in a wide variety of typologically unrelated languages including Dutch, English, French, German, Hindi, Japanese, Malayam, Mandarin, Passamaquaddy, Thai and Turkish. She suggests that the phenomenon may well be universal. That said, the catalogue of interveners differs from language to language. The list of operators that may intervene in different languages includes:

25. only, even, also, not, (almost) every, no, most, few (and other nominal quantifiers), always, often, never (and other adverbial quantifiers).

**Proposed analysis**

Our analysis builds on the work of Link (1983, 1984), Parsons (1990) and Farkas (1995, 1996a,b). In ontological matters, we follow Link’s influential (1983, 1984) algebraic (lattice-theoretic) approach. Our event semantics is of a standard Neo-Davidsonian kind: following Parsons (1990) verbs are analyzed as one-place predicates of events (or states), with arguments being added through thematic roles. Finally, we employ a dynamic, nonconfigurational approach to covariation similar to the one explored in Farkas (1995, 1996a,b).

Our approach allows us to understand PLRs, Weak Islands and Intervention Effects as just three not really different manifestations of one and the same phenomenon. Two parameters are at issue: the domain being quantified over (events or individuals, E or D) and the type of the subject phrase (referential or quantificational, <d> or <<dt>t>). Where quantification is over events and the subject phrase is referential,9 a PL reading results. Quantification over individuals results in an individual reading, whether the subject phrase

---

9 Formally, we will define this to mean that it picks out a unique set. This will allow us to include universal quantifiers in the class of referential QDPs.
is referential or quantitative. Where quantification over individuals is unavailable or impossible, a question with a genuinely quantificational subject phrase will be ungrammatical. This is what occurs with Weak Islands and Intervention Effects. In the first case, quantification over individuals is unavailable for semantic reasons: the questioned element – time, place, manner, reason – is a predicate of events. In the second case, quantification over individuals is impossible for syntactic reasons: the derivation crashes because an intervener prevents the in situ question word from checking its [Q] features.

This information is summarized in the chart below.

Table I: DP type by domain of quantification

<table>
<thead>
<tr>
<th>DP TYPE</th>
<th>REFERENTIAL</th>
<th>QUANTITATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOMAIN OF QUANTIFICATION</td>
<td>IND’L READING</td>
<td>INTERVENTION EFFECTS</td>
</tr>
<tr>
<td>INDIVIDUALS</td>
<td>Q: What did the two girls see? A: The sea lions.</td>
<td>Q: *Plusieurs filles ont vu quoi? (“What did many girls see?”)</td>
</tr>
<tr>
<td>EVENTS</td>
<td>PAIR LIST R</td>
<td>WEAK ISLANDS</td>
</tr>
<tr>
<td></td>
<td>Q: Why did the two girls go to Santa Cruz? A: G1 because she’s always wanted to and G2 because she wanted to make G1 happy.</td>
<td>Q: *Why did many girls go to Santa Cruz?</td>
</tr>
</tbody>
</table>

Intervention Effects result where the type of the subject phrase forces quantification over individuals, but an intervener (“WH-AGENT”) precludes it.
Weak Islands result where the type of the question phrase forces quantification over events but the type of the subject phrase precludes it.

**PLRs**

Recall that questions with quantifiers may have three answer types, (a) individual, (b) functional and (c) PL. We argue that the three answer types result from quantification over variables of different types: $d$ (individual), $f$ (functional) and $v$ (event), respectively. We show, first, that quantified interrogatives can be ambiguous between an object- and an event-related reading, and, second, that the truth conditions of the PL response to a quantified question are those of its event-related reading. This, we claim, motivates their analysis as quantifying over events.

---

10 Here we build on Krifka (1990). Krifka observes that quantified declaratives like *4000 ships passed through the lock* may have two readings, an object-related reading and an event-related reading. The first is true in a situation in which 4000 ships passed through the lock, perhaps multiple times each; the second is true in a situation in which a possibly much smaller number of ships passed through the lock a total of 4000 times. We show that interrogatives, like declaratives, are potentially ambiguous: they may have both object- and event-related readings. To develop this account, we construct scenarios like the one in (i).

(i) **Situation**: There are three ships. Ships A and B each made one passage through the lock. Ship C made two. Their cargo was:

- Ship A: Plastic flip flops, MP3 players, medical waste
- Ship B: Plastic flip flops, MP3 players, GM soybeans
- Ship C voy.1: Plastic flip flops, MP3 players
- Ship C voy.2: Plastic flip flops

Given this scenario, the question *What did every ship transport through the lock?* admits two different responses. The individual answer identifies two items (there are two individuals such that they were transported by every ship: plastic flip flops and MP3 players). The event answer, in contrast, identifies only one item (there is only one individual such that it was transported in every event of ship-passing: plastic flip flops).

(ii). a. What did every ship transport through the lock?
   b. Individual answer: Plastic flip flops and MP3 players.
   c. Event answer: Plastic flip flops.

11 Throughout this investigation, we rely on two types of data: speakers’ judgements as to the grammaticality of utterances and their inferences with regard to the “answerhood conditions” of questions. In the first case, we rely almost exclusively on extant data; in the second, our data is new and comes from what we believe to be a somewhat novel method of testing speakers’ intuitions. We suggest situations that have two different answer-sets, one set corresponding to the individual reading of the situation and one set corresponding to its event reading. We claim that speakers’ intuitions with regard to which answers are possible/appropriate can indicate whether a question quantifies over individuals or events or both. For example, in the situation in footnote (10), the fact that informants volunteered both
Following the Neo-Davidsonian tradition we understand verbs as one-place predicates of events with the participants in those events being introduced via event (theta) roles like “agent,” “patient” or “theme.” The standard practice is to introduce event role arguments conjunctively. In Parsons (1990), for example, a sentence like *Buffy stabbed the vampire with a stake* is analyzed somewhat as in (26). *(There exists an event and it is an event of stabbing and the agent of that event is Buffy and . . . ).*

26. \( \exists e \land \text{STABBING}(e) \land \text{AGENT}(e, \text{Buffy}) \land \text{PATIENT}(e, \text{the_vampire}). \)

We argue that simplex (“flat”) structures like the one that supports (26) are inadequate to account for the defining characteristic of PLRs, viz., covariation, the dependence of the value of the second member of each pair on the value of the first. A PL answer to a

the individual and event answers indicates that that question may quantify over either individuals or events. Not all questions are ambiguous, however. We argue that, in French and Portuguese at least, raised questions with quantificational subjects quantify over individuals exclusively. We use situations like the one in (ia) to test this hypothesis. The question in (ib) (“What did few boats transport?”) contains a quantifier, which, we will argue, precludes event quantification. This predicts that only the individual reading of the question should be available. In the situation in (ia), coffee sorts with salt on the individual reading (there are few boats that transported either salt or coffee); in contrast, coffee sorts with oats on the event reading (there were three events of oat-transport and an equal number of events of coffee-transport). We predicted that our informants would choose (c), salt and coffee, as the best answer to (b). The results were largely in accord with our prediction.

(i) a. **Situation**: There are three boats, A, B and C. A et B made one voyage each. C made three. Their cargo was:

   A: oats, salt.
   B: oats.
   C, voy. 1: oats, coffee.
   C, voy. 2: oats, coffee.
   C, voy. 3: oats, coffee.

b. **Qu’est-ce que** peu de bateaux ont transporté? (French)
   **O que é que** poucos barcos transportaram? (Portuguese)
   what is(-it) that few boats transported
   “What did few boats transport?”

c. 1. Salt.
   2. Coffee.
   3. Salt and coffee.
question like *What did the two girls see?* can be thought of as a pair of pairs: `<<Alice, a sea otter>,<Beatrice, a leopard shark>>`. The value of the second member of each pair is a function of the value of the first. We propose that the question operator Q functions like an adverbial quantifier of the ilk of *usually* or *always*. In an interrogative, we claim, the whole of the sentence minus the wh-P maps to the Restrictor (R); the whole of the sentence including the wh-P to the Nuclear Scope (NS). PLRs result in all and only those cases in which the value of the variable introduced by the wh-P covaries with the value of an element appearing in the restrictor. So, *What did the two girls see?* would be analyzed roughly as in (27) (“*” indicates (possible) plurality). We propose a dynamic semantics for the interpretation of structures like these.

27. \[ Q_e: [R*SEEING(e) \land \negAGENT(e,ATOM(THE\_TWO\_GIRLS))]_{NS*THEME(e,x)} \]

This approach lends itself to a simple, natural account of the four principal empirical puzzles associated with PLRs, viz., their distribution (the fact that they are available with only certain quantifiers), the so-called subject-object asymmetry (the fact that questions with quantifiers in subject position may lend themselves to PLRs but those with quantifiers in object position do not), the fact that PLRs are generally strongly exhaustive (a partial PL answer is not felicitous), and the fact that PLRs are exceptionally available with

12 It is commonly held that a sentence like *If the weather is good Mary usually rides her bicycle to school* asserts, roughly, that in most situations that are such that the weather is good, Mary rides her bike (cf. von Fintel 1994). The quantifier, *usually* (most), operates on two expressions, the first restricts the domain of quantification; the second supplies the nuclear scope (main predication). Here, as is generally the case with conditionals, the antecedent supplies the restrictor while the consequent supplies the NS.

13 To support this hypothesis we point out that in cases in which the questioned element arguably appears in the restrictor, the PLR is lost. This happens in the case of *Who did only the two girls see?* where the focus particle *only* structures the utterance as in (i). Here, the would-be dependent variable appears in the restrictor. As a result, covariation is simply not possible and the PLR is not available.

(i). \[ Q_e[\forall x[SEEING(e) \land THEME(e,x)]][(\exists y \land AGENT(e,y)) \rightarrow y = ATOM(THE\_TWO\_GIRLS)] \]

14 Variation in the restrictor is generated by an operator, ATOM. ATOM chooses one of the Atoms of the complex individual *the two girls*. ATOM is thus essentially an indefinite determiner. *What did the two girls see?* is equivalent to *What did a girl see?* in a universe of two girls – it simple enjoins the questionee to exhaust the universe. We want to alert the reader that this is a rather idiosyncratic definition and that the operator is more usually taken to assert the atomicity of its argument. This point is discussed in detail in Chapter III.
D(iscourse)-linked quantifiers. Consider, for example, exhaustivity.

PLRs are “exhaustive”: an incomplete PL answer is not felicitous. For example, the functional answer to *Who did every girl invite?* viz., *Every girl invited her best friend*, does not preclude any girl from inviting someone else in addition. Even if, say, Jan also invited a girl she met last Thursday at the climbing gym, *Every girl invited her best friend* remains a true and complete answer. In contrast, the PL answer, *Jan invited Sam and Sue invited Ashley*, is not a true and complete answer if Jan invited the girl from the climbing gym, too. We suggest that the exhaustive/de dicto and non-exhaustive/de re answers are in fact responses to two different questions, one asks about events, the other about individuals. (So, imagine that there are three ships, two that carried plastic flip flops and one that carried nothing. Jane knows that the two ships that carried flip flops carried flips flops; she has no information about the third ship. From our perspective, in this scenario, Jane knows what the ships carried is both true and false: it is true on its individual reading and false on its event reading.)

---

15 Heim’s (1994) solution to this puzzle is that different verbs are lexically specified to embed different Answerhood operators, one strong (AnsExh), one weak (AnsTrue). *Know*, for example, takes the first; *surprise*, the second. We believe that what is at issue is not the lexical specifications of the embedding predicate, but, rather, whether the embedded clause quantifies over events or individuals. Our approach correctly predicts, first, that answers embedded under *know* may be ambiguous if they contain a quantified referential subject and, second, that ambiguity does not obtain in cases in which the embedded answer contains a genuine quantifier. To develop this last point, for example, we consider the scenarios like the one in (i). If Jane is in information state 1, (c) is judged false: Jane does not in fact know what most ships carried. (c) is judged true, however, if Jane is in information state 2. It is no use pointing out that in the first case Jane has information about more than half of the relevant transporting-events, while in the second, she doesn’t. *Most ships* is genuinely quantificational. This, we argued, means that event quantification is not available. (c) is unambiguous.

(i) Scenario: There are three cargo ships, A, B and C. A and B made one voyage each. C made three. Their cargo was:

A: MP3 players  
B: plastic flip flops  
C, voyages 1, 2 and 3: coffee

(ii)  
a. Information state 1: C carried coffee three times.  
b. Information state 2: A carried MP3s, B carried ff’s.  
c. Jane knows what most ships carried.

If Jane is in information state 1, (iic) is judged false: Jane does not in fact know what most ships carried. (iic) is judged true, however, if Jane is in information state 2. It is no use pointing out that in the first
A unified analysis

The principal strength of this approach, we believe, is that it permits a unified analysis of three phenomena that, until now, had been treated separately. We show that, for example, the presence of the WI in (28b) and the absence of a PLR in (4a) have a common explanation: a type-mismatch.

Weak Islands

Recall that WIs are syntactic environments that permit the extraction of some wh-Ps (which, what, who) but not others (where, why, how). Not, for example, creates a WI. The which-P in (28a) can be extracted from its base position over not; the how-P in (28b) can’t be.

28.  a. Which movie didn’t many girls see __?
     b. *How didn’t many girls fix their bicycles __?

We have already summarized our claim that PLRs involve event quantification, somewhat as in (27), repeated here.

27.  Qe: [R*SEEING(e) \land *AGENT(e,ATOM(THE_TWO_GIRLS))][NS*THEME(e,x)]

Only individuals can fill event roles like AGENT and THEME: a type mismatch prevents quantifiers doing so. PLRs, we argue, are not available with genuinely quantitative DPs because these do not have atomic parts. That said, a question with a genuine quantifier will still be grammatical if an alternative interpretive strategy is available. This is the case in which, what and who questions. Thus, for example, in the case of (28b), many girls does not have atomic parts, precluding event quantification. The question does, however, lend itself to individual quantification. The resulting reading may be paraphrased: Which x is such that many girls saw it? Quantification in this case is over an individual variable (type <d>), soliciting an individual reading.

case Jane has information about more than half of the relevant transporting-events, while in the second, she doesn’t. Most ship is genuinely quantificational. This, we argued, means that event quantification is not available. (iic) is unambiguous.
We argue that in the case of *how*, *why*, *when* and *where* questions (“adverbial questions”), quantification over events is forced. Manner, reason, time and place clauses modify events: they are predicates that are defined only for events – type $<<v<vt>>$. These questions do not lend themselves to individual quantification. As a result, adverbial questions with genuinely quantitative subjects are simply ungrammatical. This is the configuration that “dooms” (29b) and other WI examples.

WIs result where quantification over events is forced but impossible: the type of the question phrase requires it but the type of the subject phrase precludes it. The same type mismatch that made a PLR unavailable in (4a) (*Who did many girls see?*), creates a WI violation in (28b). As evidence that *how*, *why*, *when* and *where* questions do indeed quantify over events and that they quantify exclusively over events, we show that these questions are unambiguous: they have an event but not an individual reading.\(^6\),\(^7\)

\(^6\)To test our prediction that adverbial questions quantified exclusively over events we proposed situations where the different event answers have a salient (immediately identifiable) “common denominator”: a single time, place, manner or reason that could theoretically serve as an answer if the question were quantifying over individuals, that is, if the question were asking what $t$, $p$, $m$ or $r$ is such that . . .

One such situation is presented in (i)

(i) Aisha got her nursing degree at Boston University. Binh got her nursing degree at the University of Massachusetts at Boston.

Question: Where did the two girls get their nursing degrees?

Event answer: Aisha got hers at BU and Binh got hers UMass Boston.

Individual Answer: In Boston.

Although the individual answer makes sense, it is not the most natural response: no one volunteered it spontaneously. When informants are not asked whether both answers are possible, but are simply asked to respond to the question, they do not generally volunteer “In Boston.” This would be the natural answer if the question asked what place $p$ is such that the two girls got their degrees there?

\(^7\) This, in turn, means that wherever adverbial questions are grammatical they have PLRs. (Adverbial questions involve event quantification; event quantification is what generates PLRs).
**Intervention Effects**

French, recall, permits both *qu*-fronted and *in-situ* questions. Quantification is possible only in the former, however. For example, the *qu*-fronted variant of the French equivalent of *Who did many girls see?* is grammatical; the *qu*-in-situ variant is not, as (29) shows.

29. a. *Qui* est-ce que *la plural* des filles ont vu?
   Who is-it that the most of the girls have seen
   “Who did most of the girls see?”

   b. *La plural* des filles ont vu *qui*?
   The most of the girls have seen who
   “Who did most of the girls see?”

   c. Les filles ont vu *qui*?
   The girls have seen who
   “Who did the girls see?”

We argue that IEs arise where quantification over individuals is semantically forced but syntactically impossible. It is forced because the subject is quantificational. Nothing in the semantics precludes individual quantification. Indeed, we find extant a question, (29a), that means exactly what (29b) would mean if it were grammatical. (29b), however, is not grammatical. Our explanation for IEs takes its inspiration from Pesetsky (2000) and other analyses that have built on it (Beck 2006, Soh 2005). According to Pesetsky, it is quantifiers that produce the intervention in IEs; according to Beck, the “culprits” are focus operators. We argue that it is “*WH-AGENT***” that intervenes. *WH-AGENT* is the interrogative counterpart of *AGENT*, the head that introduces the external argument.

**Summary of Chapter 1**

In short, we argue that PLRs, Weak Islands and Intervention Effects are three manifestations of one and the same phenomenon. At issue are the values of two parameters: the domain being quantified over (events or individuals, E or D) and the type of the subject phrase (referential or quantificational, <d> or <<dt>t>). A PL reading results
where quantification is over events and the subject phrase is referential. Quantification over individuals results in an individual reading, no matter the type of the subject phrase, referential or quantitative. Where quantification over individuals is unavailable or impossible, a question with a genuinely quantificational subject phrase will be ungrammatical. This accounts for Weak Islands and Intervention Effects. In the case of WIs, quantification over individuals is unavailable for semantic reasons: the questioned element – time, place, manner, reason – is a predicate of events. In the case of IEs, quantification over individuals is impossible for syntactic reasons: an intervener prevents the in-situ question word from checking its features. We make use of a somewhat novel technique to determine whether a question quantifies over individuals or questions. We ask our informants questions that, in the scenarios we propose, are potentially ambiguous: they have two different answer-sets, one corresponding to the question’s individual reading, the other to its event reading. Informants’ instincts as to whether the individual and event answer sets are possible or appropriate indicates whether a question quantifies over variables of type <d> or <e>. We then formalize our findings, suggesting both an algebraic and a dynamic semantics for PLRs and a minimalist syntax to account for IEs. These are extended to account for WIs.

This concludes our introduction. Chapter II presents a summary of the theoretical literature to which we make reference in the rest of this investigation. We review recent work in the areas of event semantics, nominal ontology, quantification, and dynamic semantics. In Chapters III-V, we examine PLRs, WIs and IEs in turn.
Chapter 2. Foundations

We make certain assumptions. First, we assume that verbal expressions may be properly analyzed as quantifying over events, more or less in the manner of Parsons (1990). Second, following Krifka (1989, 1992), Landman (1989a, b, 2000) and others, we assume that the domain of individuals and the domain of events have a common structure. These domains consist of both atomic and plural entities and can be modeled as i-join semi-lattices, in the manner of Link (1983, 1984). Finally, we assume that interrogative sentences – like declarative sentences with “d” or “a” quantifiers – may be properly analyzed as triadic (“tripartite”) structures (Chomsky 1976, 1977, Partee 1990a and b, in particular). We offer two derivations of the truth conditions of PLRs, one employing an algebraic semantics, the other a dynamic semantics. In the first case, we follow very closely the system proposed in Heim and Kratzer (1998); in the second, we follow Farkas (1997a, 1997b). The purpose of this chapter is to supply a brief introduction to the theoretical literature on questions, natural language quantification, event semantics, noun phrase ontology, and dynamic semantics. The essentials of algebraic semantics will be laid out on an “as needed” basis in Chapter III. As I have nothing new to add here, readers already familiar with the literature on these topics may safely skip this chapter.

Questions

Questions may be studied from various perspectives. As Dekker, Aloni and Butler (hereafter “DAB”) (2008) explain, from a syntactic perspective a question is a linguistic entity. Features that identify a question as such include, in the case of so-called constituent questions, the presence of Wh-expressions (who, what . . . ) or, in the case of polar (yes-no) questions, a certain word order (i.e. subject-auxiliary inversion, as in Will you come?). From a semantic perspective, questions are the objects denoted by these expressions. From a pragmatic perspective, questions are acts in a discourse or dialogue. Questions have received a lot of attention, for example, in the context of “Speech Act” theory (Searle 1969). By Could you close the door? for example, a speaker likely does not intend to register a genuine query with regard to the physical state of the hearer. He means, rather, to request that the hearer close the door. In what follows, we will be concerned primarily with
the semantics of questions.

What is the meaning of a question? A now well-established tradition in formal semantics associates declarative sentences with their truth conditions. A hearer understands a declarative sentence when he or she knows what it would be like if the sentence were true. DAB cite Wittgenstein’s Tractatus (4.024): “To understand a proposition means to know what is the case, if it is true.” Thus, for example, I know the meaning of *There is a fire-breathing dragon on the stairs* not if I know whether there is a fire-breathing dragon on the stairs, but if I know what would have to be the case for that to be true. In the case of interrogatives, at issue are not the sentence’s truth conditions (a question can be neither true nor false) but its answerhood conditions. I can know the meaning of a question without necessarily knowing its true answer: I can understand *How far away is the nearest potentially inhabitable planet?* even if I don’t know how far away the nearest potentially inhabitable planet is. One knows the meaning of a question when one knows, given the circumstances, not the true answer to that question, but what, under the circumstances, would count as an answer to it. In this way, the meaning of a sentence can be associated with a set of propositions, those that constitute its possible answers. In the case of a question like *How much wood can a woodchuck chuck?* this would be the set of propositions, \{*A woodchuck can chuck 1 cord of wood, A woodchuck can chuck two cords of wood, . . .*\}. This is usually formalized in the following manner. Take a constituent question like the one in (1a). (1b) gives the set of propositions that are its possible answers. (Although different authors may employ different conventions (i.e. some may use small caps and others primes to designate metalinguistic objects), we have decided to “regularize” representations to the extent possible).

1. a. Who did Mary see?
   b. \{Mary saw a, Mary saw b, . . .*\}
      where a, b, . . . are all the people in the domain.
   c. \{p: for some person a, p = that Mary saw a\}
   d. \(\lambda p \exists x [\text{PERSON}(x) \land p = ^\text{SAW}(m, x)]\)
(1b, c and d) are equivalent. A complete answer to (a) in a world \( w \) is a list of all the members of (b) which are true in \( w \). (c) uses set-theoretical notation to characterize this set; (d) does so using Montague’s Intensional Logic (IL).

It was Hamblin (1958, 1973) who first suggested this approach to the semantics of questions. Karttunen (1977) proposed modifying the approach slightly. According to Karttunen, a question \( Q \) determines for each world \( w \) the set of propositions that taken jointly constitute a complete answer to \( Q \) in \( w \). That is, Karttunen identifies a question not with the set of all its possible answers but with the set of its true answers. Many theorists make abstraction of this difference and refer to something they call the Hamblin/Karttunen (H/K) approach. We will follow suit.

In the semantics for interrogatives proposed in Groenendijk and Stokhof (1984, 1997) questions are understood as partitioning the logical space. Logical space is construed as a set of logical possibilities (possible worlds). The sentences of some formal logical language can be evaluated on such a logical space by means of an evaluation function which indicates, for each possibility, whether the sentence is true in that possibility. The assertion of a declarative sentence amounts to claiming that the actual world is among the worlds in which the sentence is true. Dekker, Aloni and Butler supply the example *Andrea is in Copenhague* (formally, \( Ca \)). Asserting *Andrea is in Copenhague* amounts to claiming that the actual world is a \( Ca \) world. Asking whether Andrea is in Copenhague, then, amounts to asking whether the world is a \( Ca \) world or a \( \neg Ca \) world. A polar question, like *Is Andrea in Copenhague*, has two possible answers, one positive, one negative. It corresponds to a bipartition of the logical space, as in (2).

\[
\begin{array}{c}
\neg Ca \\
\hline
Ca
\end{array}
\]

The foundations of this approach were developed in Frege (1892), Russell (1905) and Tarski (1936).
The partition corresponding to the constituent question *Who is in Copenhagen?* will have as many blocks as there are individuals in the powerset of the domain of discourse. If the only relevant people in the world are Andrea, Benjamin and Carlos, the partition corresponding to *Who is in Copenhagen?* would be (3).

3.

\[
?xCx
\]

\[
\neg \exists x Cx \text{ (no one is in C)}
\]

\[
Ca
\]

\[
Cb
\]

\[
Cc
\]

\[
Ca \land Cb
\]

\[
Ca \land Cc
\]

\[
Cb \land Cc
\]

\[
Ca \land Cb \land Cc
\]

The cells in (3) partition the logical space of possible worlds into mutually exclusive and jointly exhaustive sets. Such a partition represents a state of total ignorance with regard to who is in Copenhagen. In a way, in asking a question, a speaker is asking to know which of the cells of the corresponding partition the actual world belongs to. Any answer, even a partial answer will reduce the speaker’s ignorance. A partial answer rules one or more cells; a complete answer rules out all but one cell.

Formally, for G&S, questions are associated with equivalence relations over the set of possible worlds. In the case of a *yes/no* question like *Is Andrea in Copenhagen?* we get something like (4).

4. \( \lambda w \lambda w' \left[ \text{ANDREA IS IN COPENHAGUE}_w = \text{ANDREA IS IN COPENHAGUE}_{w'} \right] \)
where for any expression $A, A_{w'}$, is the value of $A$ at $w'$.

The relation in (4) holds between $w'$ and $w''$ just in case either both $w'$ and $w''$ make the proposition that Andrea is in Copenhague true or both make it false.

A partition can also be understood as a function from worlds into propositions. This function maps a world $w$ into the complete true answer to the question in $w$. To form a constituent question like *Who is in Copenhague?* G&S abstract over the position of the question word. The result is something like (5).

$$5. \lambda w \lambda w''[\lambda x[x \text{ IS IN COPENHAGUE}]_{w'} = \lambda x[x \text{ IS IN COPENHAGUE}]_{w''}]$$

**Natural language quantification**

Perhaps no subject has received as much attention in natural language semantics as has the subject of determiner quantifiers. Creswell (1973), Montague (1974), Barwise and Cooper (1981), van Bentham and ter Meulen (1985), Keenan and Stavi (1986) and many more have suggested that determiner quantifiers, like *every*, *some* and *no*, can be taken to denote second-order relations between two sets. The first set is supplied by the common noun phrase argument of the determiner; the second is supplied by the rest of the sentence. *Every*, for example, is interpreted as the subset relation, while *some* is the relation that holds just in case two sets have a non-empty intersection. So (6a), *Every dog will have his day*, asserts that the set of dogs is contained in the set of things that will have their day. And (6c), *Some duckling is ugly*, asserts that the intersection of the set of ducklings and the set of ugly things is not empty.

$$6. \begin{align*}
\text{a. Every dog will have his day.} \\
\text{b. } & \forall x[\text{DOG}(x) \rightarrow \text{HAVE}(x,\text{DAY},x)] \\
\text{c. Some duckling is ugly.} \\
\text{d. } & \exists x[\text{DUCKING}(x) \land \text{UGLY}(x)]
\end{align*}$$

Generally, for any sets $A, B$, *every*, *some* and *no* can be defined as in (7).
7.  a. \[ [[\text{every}}](A,B) \leftrightarrow A \subseteq B \]
    b. \[ [[\text{some}}](A,B) \leftrightarrow A \cap B \neq \emptyset \]
    c. \[ [[\text{no}}](A,B) \leftrightarrow A \cap B = \emptyset \]

The first argument (A) is referred to as the restrictor: it supplies the domain over which the quantifier quantifies. The second argument (B) supplies the nuclear scope. This is represented graphically in (8). The structure in (8) is called a tripartite structure (cf. Partee 1990a).

8.

```
S
  Operator
    Restrictor
      Nuclear Scope
```

For example, in the case of (6c), \textit{Some duckling is ugly}, the Operator is \textit{some}; \textit{duckling} maps to the Restrictor; \textit{ugly} to the Nuclear Scope.

Operators of all sorts, not just determiner quantifiers, have been profitably analyzed as restricted quantifiers. Such operators include focus particles like \textit{only} and \textit{even}, modals like \textit{must} and \textit{can}, and adverbial quantifiers like \textit{always} and \textit{sometimes}. In the case of focus particles, quantification may be over events; modals are usually taken to quantify over possible worlds; and adverbs, over events (construed as tuples of variables) or situations. It has already been suggested that the interrogative operator, too, may be analyzed as a restricted quantifier (see, in particular, Gutierrez-Rexach (2003, 2005) and works cited therein). This approach, we will argue, permits an elegant analysis of the phenomena under investigation.


To know the meaning of a sentence is to know its truth conditions. This is a theoretical primitive of orthodox formal semantics in generative grammar (Heim & Kratzer 1998:ch.
1). I know the meaning of *There is a purple gula monster sitting on my lap* (Pitkin 1972) if I know what would have to be the case for that to be true. A second theoretical primitive of formal semantics, and, indeed, of generative grammar generally, is that the meaning of a complex constituent is derived compositionally from the meaning of its subconstituents (Hornstein, Nunes & Grohmann 2007: 5). With this in mind, compare (9a) and (9b).

9. a. John only gave tulips to MARY.
   
b. John only gave TULIPS to Mary.

The two sentences are made up of the same subconstituents. They differ from each other only in the placement of pitch accent: in (9a) *Mary* is stressed; in (9b), *tulips* is. Meaning is sensitive to prosody: the truth conditions of the two sentences respond to this difference. If John gave tulips to someone else in addition to Mary -- Nancy, say -- (9a) is falsified, (9b) is not. Similarly, if John gave Mary something else in addition to tulips -- irises, say -- (9b) is falsified, (9a) is not. This is an example of "association with focus." The truth conditions of a sentence which manifests association with focus depend on the positioning of focal accent (Krifka, n.d.).

Like constructions which contain overt quantifiers, the various constructions in which focus has a truth-conditional effect require a tripartite structure for their interpretation. The focus-frame (topic, background) maps to the restrictor; focus, to the nuclear scope. In the case of *Mary only plants TULIPS in the garden*, the restrictor is events of Mary planting *something* in the garden; and the nuclear scope is the proposition that Mary plants tulips in the garden. *Only* occupies the place of the quantifier -- *only* is to events what *every* is to objects. In the case of *Mary only plants tulips in the GARDEN*, the restrictor is events of Mary planting tulips *somewhere* and the nuclear scope is the proposition that Mary plants tulips in the garden.

**Modals**

We said that to know the meaning of a sentence was to know its truth conditions -- to know what would have to be the case in the world for the sentence to be true. From this perspective, it is not immediately evident what should be done with a sentence like *Peter
really shouldn’t have told you that. Kripke (1959, 1963) proposed that sentences with modals (must, can, should, could, . . .) be understood as quantifying is over possible worlds. Must, like only, translates as a universal quantifier; can translates as an existential quantifier. Must α is true in a world w iff α is true in all worlds R-accessible from w; \(^19\) can α is true in w iff α is true in some world R-accessible from w. The “R-accessible worlds” supply the restrictor. This set will vary depending on the sort of modality under discussion (epistemic, deontic, etc.) and on other pragmatic factors (Kratzer 1977). In (10a), for example, must has an epistemic flavor; in (10b) can is deontic.

10. a. The students must all be asleep (I don’t see any lights on in the dorms).
   b. Alison can stay out until midnight (her mother said so).

Adverbs
Sentences where focus is relevant to the truth conditions can be analyzed as quantifying over events, with the focus operator (only, even, . . .) supplying the quantifier. The restrictor set is determined by the topic; the nuclear scope, by the focus. Modal sentences can be analyzed as quantifying over possible worlds; the modal operator (must, can, . . .) supplies the quantifier. Here the restrictor set is determined by the modal base and other pragmatic factors, the nuclear scope is the corresponding modal-less proposition. With adverbs of quantification (always, sometimes, . . .), quantification may be over cases. In (11), for example, usually would supply the operator, x is a quadratic equation the restrictor, and x has two different solutions the nuclear scope. usually would be understood as relating cases of something being a quadratic equation with cases of that something having so-many solutions (Hajicova, Partee and Sgall 1998: 13-21).

11. A quadratic equation usually has two solutions.

Cases here are construed formally as tuples of variables. Although in (11) we have just one variable, adverbs of quantification can unselectively bind any number of free variables in their scope. The “donkey sentence” in (12a), for example, is true just in case most pairs of

\(^{19}\) [[□p]]M,w = 1 iff [[p]]M,w’ = 1 for all w’ s.t. wRw’, where [[α]] indicates the semantic value of an
things that satisfy the restrictor also satisfy the nuclear scope, as in the LF in (12b) (Partee, 1990).

12. a. Usually, if a woman sees a goat, she pets it.
   b. Usually, $x_1$ is a woman and $x_2$ is a goat and
   
   $e_1: x_1$ sees $x_2$, $e_2 > e_1$ and $e_2: x_1$ pets $x_2$

Alternatively, adverbs may be understood as quantifying over situations. Conditional clauses, too, are analyzed in this way (Lewis 1975, Kratzer 1978, von Fintel 1994). The if-clause supplies the restrictor; the consequent, the nuclear scope. In the case of (13) these are situations in which Mary misses the bus and situations in which she walks, respectively.

13. If Mary misses the bus she always/usually/seldom/never walks home.

Thus, it seems, that natural language quantifies not just over individual variables, but variables of several sorts. It is widely held that, in addition to the variables mentioned here – events and possible worlds – natural language quantifies over functions (in particular, choice functions (see Reinhart 1997). It has also been suggested that natural language quantifies over function-individual pairs or pairs of entities and reference situations (Moltmann 1997). Although scholars generally try to avoid adding to the catalog of natural language variables, they will not hesitate to do so where “independently necessary.”

**Question words**

Like quantificational determiners, focus particles, modals and adverbs of quantification, question words may be analyzed as general quantifiers (Gutierrez-Rexach 2005: 887). Question words – or “interrogative quantifiers” – share many properties with determiner-and other quantifiers. For example, like determiner quantifiers, interrogative quantifiers are conservative. Conservativity is defined in (14).

14. A Determiner with arguments A and B is conservative iff $D(A)(B) =$

---

expression $\alpha$, $\Box$ is the necessity operator, and “1” represents the truth value “True” (Partee 1988: 2).
D(A)(A\cap B).

For example, we can test the determiner *all*. Take *All ducks quack*. D is *all*, A is *ducks* and B is *things that quack*. *All ducks quack* (D(A)(B)) is indeed equivalent to *All ducks are ducks that quack* (D(A)(A\cap B)). We conclude that *all* is conservative. Conservativity is a natural language universal: all NL quantifiers are conservative on their first argument (Keenan and Stavi 1986). Gutierrez-Rexach points out that *which-N* is conservative: *Which students are rich?* is equivalent to *Which students are students and are rich?*

We will suggest in Chapter III that the question operator can be treated like an adverb of quantification of the ilk of *often, usually, sometimes, and never*. The question operator will be taken to express a relation of two sets of eventualities or situations (de Swart 1991). The whole of the sentence minus the wh-P maps to the restrictor, the wh-P or the whole of the sentence plus the wh-P, to the nuclear scope.

**Event semantics**

In the classic semantics of Montague (1973) and Thomason and Stalnaker (1973) a transitive verb, like *stab* in *Buffy stabbed the vampire*, is understood, following logicians like Russell (1905), as expressing a relation between the two nominal arguments, as in (14a). The extension of a transitive verb is taken to be the set of pairs of individuals that stand in the relevant relation one to the other. For example, if a, b, c, d, e, f, and g are all the people in the universe, and if a stabbed b and e stabbed f and no one else stabbed anyone else, the extension of *stab* is \{\langle a,b\rangle,\langle e,f\rangle\} (Gamut 1991: ch.3). On this account, adverbs, like *with a stake*, are verb modifiers, functions from verbs to verbs, as in (15b).

15. a. \text{STAB} (b,v)
   
b. \((\text{WITH}(s)(\text{STAB}))\)(b,v)

Davidson (1967) proposed that verbs be understood, rather, as expressing relations between the nominal argument(s) and an implicit event argument which is existentially quantified over, as in (16a). (16a) may be paraphrased: there is an event which is an event of stabbing
involving Buffy and the vampire. Modifiers are added conjunctively as predicates of the event argument, as in (16b).

16. a. $\exists e [\text{STAB}(e, b, v)]$
   b. $\exists e [\text{STAB}(e, b, v) \land \text{WITH}(e, s)]$

In Parsons’ (1990) “neo-Davidson” event semantics, verbs are understood not as multi-place predicates relating events and their participants, as in (16), but as expressing simple (one-place) predicates of events, as in (17). What Davidson and the classical theorists thought of as arguments of the verb are, in Parson's system, tied to the verb indirectly. Relations, standardly provided by theta roles, link the event described by the verb to the participants in that event, as in (17a). (17a) may be paraphrased: There is an event which is an event of stabbing, the agent of this event is Buffy and the theme of this event is the vampire. Both arguments and modifiers are added conjunctively, as in (17b).

17. a. $\exists e [\text{STAB}(e) \land \text{AGENT}(e) = b \land \text{THEME}(e) = v]$
   b. $\exists e [\text{STAB}(e) \land \text{AGENT}(e) = b \land \text{THEME}(e) = v \land \text{INSTRUMENT}(e) = s]$

The value of analyzing natural language sentences in this way is that it permits a fruitful explanation of a wide range of semantic characteristics of natural language.

Davidson’s original argument for thinking of sentences as descriptions of events stems from the semantics of adverbs. The entailment patterns that we find with adverbs are very neatly accounted for when we treat adverbs like in the heart and while doing an aerial as predicates that apply to an event introduced by the verb. In (18), (a) entails all of (b), (c) and (d); (b) and (c) entail (d). The generalization is that longer conjunctions entail shorter ones.

18. a. Buffy stabbed the vampire in the heart with a stake.
   b. Buffy stabbed the vampire in the heart.
   c. Buffy stabbed the vampire with a stake.
d. Buffy stabbed the vampire.

This entailment pattern is often represented as diamond, as in (19):

19.

```
 a
 b  c
  d
```

Other advantages of this approach are that it naturally fits with the facts that adverbials can be iterated freely and that many of them can be genuinely optional (Herburger 2000: 7).

Parsons (1990, ch. 1) writes that it also accounts for:

- The semantics of perception statements. For example, take the relation between *A novice slayer saw Buffy stab the vampire* and *A novice slayer saw the stabbing of the vampire by Buffy*.

- The semantics of causatives and inchoatives. It accounts, for example, for why, if Mary will open the door, the door will open and why this in turn entails that the door will be open.

- Relations between the explicit ways we talk about events and our sentences that do not appear to involve explicit reference to events at all. In this context consider the relation between *A flight over the pole by a Norwegian took place in May 1926* and *A Norwegian flew over the pole in May 1926*.

- The relation between “causative” sentences with events as subjects and the same sentences with agents of events as subjects. Example: *Mary’s singing broke the window* and *Mary broke the window*. 
- In Landmann (1989a and b, 2000) event semantics is invoked in the service of an account of plurality and cumulative/distributive readings.

- In Herburger (2000) it is invoked in the service of a simple and empirically detailed analysis of the effects of focus.

We will add to the list of natural-linguistic phenomena that are accounted for in this approach. To anticipate: We suggest that it is possible to analyze a question like *What did the two slayers use to stab the vampire?* as somehow “asking about” an event.

We will see in Chapter III that quantified sentences – interrogatives as well as declaratives - may be ambiguous between an object (individual) reading and an event reading. For example, *4000 ships passed through the lock last year* can either mean that there were 4000 different ships that passed through the lock, perhaps more than one time each, or that some possibly lesser number of ships passed through the lock a total of 4000 times. The first corresponds to the individual reading, the second to the event reading (Krifka 1990). This ambiguity is preserved in the interrogative variants of these sentences. Thus, *How many ships passed through the lock last year?* may have two different true answers. It seems reasonable to hypothesize that these two readings result from quantification over variables of different types, individual and event variables respectively, somewhat as in (20).

20. a. What quantity of *x*, *x an individual ship*, *x* passed the lock last year
   
   b. What quantity of *e*, *e an event of ship-passing*, *e* occurred last year

**Ontology**

As we will see in Chapter III, an adequate account of Pair List Readings (PLRs) needs to be able to offer an explanation of why PLRs are available with some quantifiers but not with others. (21a), for example, has a PLR but the minimally different (21b) does not.

21. a. How did the three slayers kill the vampires?
   
   b. How did most of the slayers kill the vampires?
We will argue that the relevant difference between the two is that in the first case but not the second (a) the quantifier is not genuinely quantificational but referential\textsuperscript{20} and (b) it is, further, complex, a sum individual in the sense of Link (1983). In the case of the three slayers we have something like (22).

\[\sigma^*\{x \in \text{SLAYER}: |\text{SLAYER}| = 3\}\]

The purpose of this section is to discuss some notions of set theory and to define the sigma (\(\sigma\)) and star (\(\ast\)) operators.

**Individuals and sets**

Are the 52 cards on the table and the deck that they make up the same or different? What about the three witches stirring their cauldron and the coven they make up? Same or different? Link (1983) argues persuasively that the cards and the deck of cards, while consisting of the same matter, are distinct objects. The same goes for the witches and the coven (although that’s not the example he uses). The linguistic expressions the 52 cards and the 3 witches refer to sums; the deck and the coven more usually refer to groups. A sum and a group are created by linguistic expressions involving different structures. A sum is a collection: the sum of a and b is a plural object; a group is a fusion: it is a singular object. Link discusses the example of two rings recently made of some old Egyptian gold. The rings, a sum, are new; the stuff, a group, is old. Type-logically, though, sums and groups are both individuals, type <\(d\)>.

Although some of the finer points are a matter of debate (Kratzer (2003), for example, questions whether it would be possible to do away with the category group), Link’s ontology of nominal expressions is widely accepted.

**Sums**

We follow Landman’s (2000) formalization of Link’s insights.

\textsuperscript{20} Here we beg the patience of those more familiar with the literature on PLRs. In Chapter III we defend this claim at length.
Assume a domain of singular and plural individuals ordered by the operations sum ⊕ and part-of ≤.

Plural individuals are sums of singular individuals. The plural individual *jane and mary* is the sum of singular individuals *jane* and *mary*, and both *jane* and *mary* are part of the plural individual. Singular individuals differ from plural individuals in that the former have only themselves as a part: they are atoms with respect to the relation part-of.

*and* is interpreted as the sum operation:

\[ \text{jane and mary} \rightarrow (j \oplus m) \]

Singular common nouns denote sets of atomic individuals:

\[ \text{girl} \rightarrow \text{GIRL} \text{ where GIRL} \subseteq \text{ATOM} \]

Pluralization corresponds to the *-*operation:

\[ \text{girls} \rightarrow *\text{GIRL} \]

*GIRL* is the closure of the singular predicate GIRL under sum: i.e. it adds to the denotation GIRL all the sums you can form with elements of the denotation GIRL.

For example, if GIRL = {j, b, h} then *GIRL = {j, b, h, j \oplus b, j \oplus h, b \oplus h, j \oplus b \oplus h}*

Part of. We define a relation ≤ by: a ≤ b iff \( \{a, b\} \subseteq b \). ≤ is a partial order on D (it is reflexive, transitive, and anti-symmetric).

A domain of singular and plural individuals is a structure \( D = \langle D, \ominus, \text{AT} \rangle \) where: \( \langle D, \ominus \rangle \) is an atomic part-of structure with a set of atoms AT. Such part-of structures are up to isomorphism exactly the complete Boolean algebras with 0 deleted and the operations restricted to (generalized) ⊕ (Theorem).
Groups

An operation of group formation maps sums of individual atoms into atoms. It maps non-atomic sums of individuals onto group atoms; individual atoms are mapped onto themselves. Group formation turns any sum of individuals into a collective entity in its own right, no longer strictly determined by its part-of structure. An inverse operation, membership specification, maps atoms into sums of individual atoms and group atoms onto the sums of their members; individual atoms, again, are mapped onto themselves.

Formally:

A domain of singular and plural individuals with groups is a structure:

\[ D = \langle D, \oplus, AT, IND, GROUP, \uparrow, \downarrow \rangle \]

where:

1. \(< D, \oplus, AT \rangle\) is a domain of singular and plural individuals.

2. \(AT = IND \cup GROUP\) and \(IND \cap GROUP = \emptyset\)

Let \(SUM = [IND]\)

3. \(\uparrow\) is a one-one function from \(SUM\) into \(ATOM\) such that:
   1. \(\forall d \in SUM-IND: \uparrow(d) \in GROUP\)
   2. \(\forall d \in IND: \uparrow(d) = d\)

4. \(\downarrow\) is a function from \(ATOM\) into \(SUM\) such that:
   1. \(\forall d \in SUM: \downarrow(\uparrow(d)) = d\)
   2. \(\forall d \in IND: \downarrow(d) = d\)

\(SUM\) is the set of sums of individuals. \(SUMOFGROUP\) is the set of sums of groups. Note that \(IND \subseteq SUM\); if we want to refer to the domain of non-singular sums, this domain is \(SUM-IND\).

Finally, \(the\) is interpreted as the \(\sigma\) operator: Link’s \(\sigma\) operator is equivalent to the iota operator.

\[
\begin{align*}
the \ girl & \rightarrow \sigma(GIRL) \\
the \ girls & \rightarrow \sigma(*GIRL)
\end{align*}
\]
This machinery, writes Landman, permits a more satisfactory analysis of examples like (23).

23. The cards below 7 and the cards from 7 up are separated.

With the addition of groups to this ontology, the plural NP *the cards below 7* in (22) can shift its interpretation – from a plural entity (the sum of the cards below 7) to an entity in its own right, a group atom. *The cards below 7 and the cards from 7 up* can then be interpreted as a sum of groups, as in (24).

24. \( \uparrow(\sigma^*\{x \in \text{CARD}: x<7\}) \oplus \uparrow(\sigma^*\{x \in \text{CARD}: x>7\}) \)

An extension to the domain of events

In section 2 of this chapter we reviewed arguments to the effect that natural languages quantify not only over individuals, but also over events. The question becomes: what is the structure of the domain of events? Landman (1989a and b, 2000), Krifka (1989, 1992), Nakanishi (2004, 2005) and others have suggested that the domain of events, like the domain of individuals, may be understood as consisting of atoms, sums and groups, and that it is structured, like the domain of individuals, as an i-join semi-lattice. Again, we adopt Landman’s formalizations.

Landman’s (2000) immediate concern is to give an account of collective and distributive readings. Look at the examples in (25).

25. a. Aarifa and Bo-Bae walked.
   b. Aarifa and Bo-Bae carried the piano upstairs.
   c. Aarifa and Bo-Bae met.

*Walk* is a distributive predicate. With distributive predicates the inference \((a \text{ and } b)P \rightarrow aP \text{ and } bP\) is licensed. From (25a), for example, we may infer that Aarifa walked and that Bo-Bae walked. In the case of collective predicates, this inference is not licensed. So, from
(25c), in contrast, we may not infer that Aarifa met and that Bo-Bae met. *Meet* applies to the collection of Aarifa and Bo-Bae, but not to either of the girls individually: the predicate *meet* does not distribute over the units – a and b -- that constitute the subject. Predicates like *carry the piano upstairs* are ambiguous, lending themselves to both collective and distributive interpretations.

Landman assumes that the grammar contains a single operation that forms semantically plural predicates out of semantically singular predicates, nominal or verbal. According to Landman all basic predicates, nominal or verbal, are interpreted as sets of atoms. What is lexically specified is what kind of atoms they take in their extension: *boy* and *walk*, for example, take individual atoms, the first from the domain of individuals, the second from the domain of events; *meet* does not take individual atoms but group atoms, from the domain of events; *carry the piano upstairs* takes either individual or group event atoms. Singular predicates are applied to singular things, individuals or groups; plural predicates are applied distributively to sums of singular individuals (the corresponding singular predicate is applied to the individual parts of the sum).

The **Unique Role Requirement** is the pivot of Landman’s account of distributivity. The URR states that if a thematic role is specified for an event it is uniquely specified. This, writes Landman, guarantees distinctness of events in all cases where a role gets specified twice (with different values). (Roles taking plural events as argument or plural individuals as values are non-thematic.) Because of this one-one mapping, the identification of the value of the individual that fills the event role will contingently but necessarily identify the event. We, too, will invoke the URR in chapters III and V.

Landman operationalizes the URR by defining thematic roles as partial functions from events to individuals (*role* ∈ *CON<ed>*>). If e is an event in E, and for every atomic part a of e, thematic role R is defined for a, then plural role *R* is defined for e, and maps e onto the sum of the R-values of the atomic parts of e. So the plural agent of a sum of events will be the sum of the agents of the atomic parts of the event, and so on for the other roles. *sing*, for example, would be assigned the meaning in (26). And (27) would generate the
collective reading of *Three boys sang*. (27) may be read: There is a sum of singing events whose plural agent is three boys. (27) is equivalent to (28), which gives the distributive reading.

\[ \lambda x \{ e \in * \text{SING}: * \text{AG}(e) = x \} \]

\[ \exists e \in * \text{SING}: \exists x \in * \text{BOY} \land |x| = 3 \land * \text{AG}(e) = x \]

\[ \exists x \in * \text{BOY}: |x| = 3 \land \exists e \in * \text{SING}: * \text{AG}(e) = x \]

Our task in Chapter III will be to account for the Pair-List reading of questions like (29a). We have, at this point, a good deal of what we need in order to accomplish this task. In particular, plural events and the URR will figure prominently in our analysis. We do not yet, however, have everything we need. Making use of the machinery we have at this point, we might try simply replacing Landman’s existential quantifier with an interrogative quantifier. In the case of (29a) this might give us something like (29b). Roughly: What seeing event whose agent is two girls has theme y? Given the URR, identifying the theme effectively identifies the event.

29. a. What did the two girls see?
    b. Q \( e \in * \text{SEE}: \exists x \in * \text{GIRL}: |x| = 2 \land * \text{AG}(e) = x \land * \text{TH}(e) = y \)

The principal limitation of (29b) is that it cannot account for the dependence of the value of \( y \) on that of \( x \). In Landman’s simplex formula, event roles are added conjunctively. Theme is thus blind to Agent and covariation is left unexplained. To account for the covariation characteristic of PLRs, we will invest (29b) with more structure. We take on this task in Chapter III.

**Dynamic semantics**

By way of introduction, we discuss one of the puzzles which dynamic semantics was developed to solve. The puzzle is that of the extraordinary scope possibilities of indefinites. Indefinite Noun Phrases (INPs) -- *a unicorn, some goola monster, another day* -- do not seem to be subject to the normal locality constraints that limit the movement of
syntactic constituents (Reinhart 1997). For example, in general, the movement of a constituent outside a relative clause that contains it is not possible, either in the overt syntax that feeds the phonetic component or in the covert syntax that feeds the semantic component. Relative clauses -- like coordinate structures, if-clauses and others -- represent syntactic islands. Thus, in (30a), how much cannot be displaced outside the relative clause that was worth at least \( x \), in (30b) what is limited by the coordinate structure spring-flowering bulbs and \( x \), and in (30c) who cannot get outside if Mary sees \( x \).

30. a. * How much did every boy steal something that was worth at least \( t_i \) ?  
   b. * What did every girl buy spring-flowering bulbs and \( t_i \)?  
   c. * Who if Mary sees \( t_i \) will she run and hide?

Contrasts like the one in (31), then, might indicate that while QPs, like the \( \text{wh} \)-Ps in (30), are bound by syntactic islands, indefinites are not so constrained.

31. a. Every student read a paper that had been written by every professor.  
   b. Every student read a paper that had been written by some professor.

As Chierchia (2004) points out, (31b) is ambiguous: it may mean either that there exists a specific professor such that every student read a paper written by that professor or it may mean that every student read a paper written by a possibly different professor. By contrast, (31a), in which the indefinite some professor is replaced by the QP every professor, has only a single reading.

(31b) is often diagnosed as a case of scope ambiguity. The first (“specific”) interpretation results when the syntax raises the indefinite some professor to a position where it can take wide scope (WS) over the QP every student; the second interpretation results when the QP takes wide scope over the indefinite; the indefinite is said, then, to take narrow scope (NS). The two LFs are given in (31b’) and (31b”).

31. b’ some professor, every student, \( t_i \) read every paper [that had been written by \( t_j \)]
If (31a) is not ambiguous, it is hypothesized, that is because the configuration that would have generated the "other" reading is not available: the QP in (31a), unlike the indefinite in (31b), seems not to be able to take scope outside of the relative clause *that had been written by* $x$. The reading that would have been generated if it could take WS is not there: in (31a), papers cannot vary with students. As Chierchia observes, the only available reading is the pragmatically improbable one where every student read a paper jointly written by all the professors. The puzzle is: Why would the covert movement of an indefinite like *some professor* not be limited by syntactic islands?

Farkas (1997a,b) proposes a solution to this puzzle in the context of a dynamic semantics similar in spirit to the Dynamic Predicate Logic of Groenendijk and Stokhoff (1991). In dynamic semantics a sentence is not understood as an independent proposition, but, rather, as a *context change potential*. Only an entire discourse is said to have truth conditions, while a sentence functions to change the previous information state. What is tracked is the change in available discourse referents and the way they are anchored to entities. From this perspective, it is possible to analyze scope ambiguities as resulting from dependencies between evaluation indices of variables. We take the time to set out the essentials of what is, admittedly, a rather intricate system because it provides the model for our dynamic analysis of PLRs in Chapter III.

Farkas assumes, as is standard, that semantic interpretation involves two related levels of representation, syntactic structure and logical form (lf). If expressions are taken to determine the *satisfaction conditions* of the linguistic expressions they are associated with relative to a model $M$, a context $c$, and an assignment function $g$. The model consists of a triplet, $<W,D,I>$ where $W$ is a set of worlds, $D$ a set of sorted individuals and $I$ a valuation function assigning intentions to constants. An expression $z$ is satisfied in $w$ wrt $M$ and $c$ iff there is an assignment function $g$ such that $z$ is satisfied relative to $g$ in $w$ and $c$, abbreviated $(z)_{g,w,c}$. 
For example, the lf of (32a) would be (32b). Here, the one-place predicate *man* restricts the domain from which values of the variable $x$ may be drawn; *leave* supplies the main predicate.

32. a. A man left
   
   b. $(x: \text{MAN}(x))\text{LEAVE}(x)$

*A man left* is satisfied in $w$ wrt $M$ and $c$ iff there is a function $g$ such that $(x: \text{MAN}(x))\text{LEAVE}(x)_{g,w,c}$. This condition is met iff (i) $g(x,w) \in I(\text{MAN},w)$ and (ii) $g(x,w) \in I(\text{LEAVE},w)$.

In the case of expressions that contain quantifiers, lfs take the general form in (33), where R stands for restrictor and NS for nuclear scope.

33. $Qx[\ldots x \ldots]_{R} [\ldots]_{\text{NS}}$

Here, an expression $z$ is satisfied in $w$ wrt $M$ and $c$ iff $Q$-many ways of satisfying $z_R$ relative to $g,w,c$ are ways of satisfying $z_{NS}$ relative to $g,w,c$, where $z_R$ and $z_{NS}$ are the lfs of the Restrictor and the Nuclear Scope respectively. Where quantification is over individuals, a way of satisfying the restrictor amounts to choosing an evaluation function that assigns to $x$ a value that meets its restrictive expression, contributed by the Domain Condition (DC) on the quantificational NP. One considers whether $Q$-many of the functions that satisfy $z_R$ have extensions that satisfy the NS. We say that a function $g'$ *extends* a function $g$ wrt a set of variables $X$ iff $g'$ agrees with $g$ on all assignments except for the variables in $X$. $g'(g/x)$ indicates that $g'$ extends $g$, and $x$ is in the extension set of $g'$. So, the expression in the Restrictor has to be satisfied relative to a set of functions $G'$ which extend $g$; the expression in the NS has to be satisfied relative to a set of functions $G''$, each of which extends a function in $G'$. Formally stated the satisfaction conditions for quantified sentences are:

Where $z$ is an expression of the form (32), $z$ is satisfied in $w$ wrt $M,c$ iff there is an $g$ such that $(z)_{g,w,c}$. This condition is met if there are $Q$-many functions $g'$ which extend $g$ wrt $x$ st $(z_{NS})_{g',w,c}$, st each $g'$ has a (possibly trivial) extension $g''$ st $(z_{NS})_{g'',w,c}$. 
34. a. All students passed.
   
b. \( \forall x [x \text{\:STUDENT}(x)]_R \ [\text{PASS}(x)]_{NS} \)

c. (33b)_{g, w, c} \text{ iff there is some function } g \text{ with the property: every } g'(g/x) \text{ such that } g'(x, w) \in I(\text{STUDENT}, w) \text{ has the property of having a trivial extension } g'' \text{ such that } g''(x, w) \in I(\text{PASS}, w) \)

Farkas invokes this machinery in the service of an explanation of what she calls "dependent indefinites." She calls attention to the example in (35). (35a) contains two quantifiers, the universal, every child, and the existential, a book. The sentence has two readings, one in which the indefinite takes WS, one in which it takes NS. On the WS reading, every student reads the same book; on the NS reading every student reads a potentially different book. Now, in Farkas’ system, child, the domain condition (DC) of the subject phrase, necessarily maps to the restrictor: the variable contributed by the universal will be in the extension set of \( G' \), the base set of the restrictor. book, being contained in the main predication, maps to the nuclear scope. The NS reading will result where the variable contributed by the indefinite is in the extension set of \( G'' \), as in (35b) (the functional index specifies which function assigns values to the variable). The functions in \( G'' \) are dependent on the functions in \( G' \) because they are defined by associating to every \( g' \) in \( G' \) a function \( g'' \). Because \( y \) is in the extension set of \( G'' \) it covaries with \( x \), i.e. \( y \) depends on \( x \) and \( x \) is the domain variable of \( y \). In general, a variable is said to have narrow scope relative to a quantifier iff it co-varies with the variable bound by the quantifier. The WS reading will result where the variable contributed by the indefinite is evaluated by the base function \( g \), and is not in the extension set of either \( G' \) or \( G'' \). (35c) would produce a reading where a book has wide scope.

35. a. Every child read a book by Astrid Lingrin
   
b. \( \forall x [x \text{\:CHILD}(x)]_{G'} \ [y_{G''}: \text{BOOK-BY-A.L.}(y) \text{ READ } (x, y)]_{G''} \)

c. \( \forall x [x \text{\:CHILD}(x)]_{G'} \ [y_{g}: \text{BOOK-BY-A.L.}(y) \text{ READ}(x, y)]_{G''} \)

The satisfaction conditions in the case of the NS reading are: for every function \( g'(g/x) \)
such that $g'(x,w) \in I(\text{CHILD},w)$, there is an extension $g''(g'/y)$ such that $g''(y,w) \in I(\text{BOOK-BY-A.L.}, w)$ and $<g'(x,w), g''(y,w)> \in I(\text{READ},w)$.

In the case of the WS reading, the satisfaction conditions are: for every function $g'(g/x)$ such that $g'(x,w) \in I(\text{CHILD},w)$, there is a trivial extension $g''$ such that $g(y,w) \in I(\text{BOOK-BY-A.L.}, w)$ and $<g'(x,w), g(y,w)> \in I(\text{READ},w)$.\textsuperscript{21}

We will see in Chapter III that this approach supplies a rather neat analysis of PLRs. Among its advantages are that no additional machinery need be invoked in order to explain two of the long-standing puzzles with regard to PLRs, viz., the set-of-questions effect and the subject-object asymmetry.

**Summary of Chapter 2**

The purpose of this chapter was to provide a summary of some of the theoretical literature to which we make reference in chapters III-V. Following Parsons, who follows Davidson, we showed that verbal expressions can be understood as quantifying over events. Following Krifka and Landman, we then showed that the domain of events, like the domain of individuals, can be understood as structured as an i-join semi-lattice and contains both atoms (singular and plural) and groups (complex atoms). We suggested that some

\textsuperscript{21} Quantification over situations works in much the same way as does quantification over individuals. Situations are taken as parts of worlds. Every $w \in W$ determines its own extensional model $M_w$, such that $M_w = <S_w, U_w, V_w>$ where $S_w$ are the situations in $w$, $U_w$ the individuals in $w$, and $V_w$ a valuation function assigning denotations to constants relative to situations in $S_w$. Expressions are evaluated with respect to an extensional model $M_w$. Quantification is over a contextually supplied subset of $S_w$, the situations in $w$. The situations $s''$ depend on $s'$ the same way $f''$ depends on $f'$. For example, the general form of the If of a factual conditional sentence would be: $\forall s'[I_f]s'[I_f]^s'$. ($\forall s'[I_f]s'[I_f]^s''$) is satisfied in $w$ wrt $M_w$ iff there is an $f$ with the following property: for every $s' \in S_w$ such that $(I_f)s', s', c$, there is a situation $s'' \in S_w$ such that $s'$ is part of $s''$ and $(I_f)s''$.

When an indefinite has narrow scope relative to the quantifier in examples involving modal or situational quantification the variable contributed by the indefinite covaries with the world or situation level variable bound by the quantifier. This means that the function interpreting the variable is to be evaluated at each world/situation in the domain of quantification.

(i) Often when he is sick, Johnny reads a Dorothy Sayers mystery.

Assume the indefinite contributes a variable $y$, and that the sentence is evaluated relative to a world $w$ and a function $f$. If the indefinite is indexed by $s''$, we get the NS reading.
interrogative sentences resemble declarative sentences with adverbial quantifiers: the former, like the latter, may be interpreted as quantifying over events or situations (Lewis 1975, Heim 1982, Partee 1990). We further suggested that the tripartite structures on which event-quantified sentences are resolved lend themselves very naturally to interpretation in a dynamic framework like the one proposed in Farkas (1997a, 1997b).
APPENDIX I: PLURAL EVENTS, PLURAL INDIVIDUALS and QVEs.

This appendix has the purpose of surveying the use of similar concepts and techniques in the analysis of a closely related question. Endriss and Hinterwimmer (2006) use quantification over events and sum individuals to account for Quantificational Variability Effects (QVEs).

“QVE” names a phenomenon where the force of a quantificational adverb seems to fall on a DP (Berman (1991)). At issue are sentences like (36).

36. The people who lectured on kangaroos at the conference last summer were usually open-minded.

E&H argue that QVEs in sentences with plural definites result when the NP complement of the quantifier varies with respect to the eventualities. In the kangaroo example quantification is over eventualities each of which contains an atomic part of the sum individual denoted by the plural definite, that is, eventualities in which one of the people who lectured on kangaroos lectured on kangaroos.


37. For the most part the students admire MARY.

N&R hypothesize that a sentence of the form for the most part NP VP has the truth conditions in (38), where \( p \) corresponds to the denotation of the non-focused part of the clause and \( q \) to that of the focused part.

\[
38. \exists e \ [(p(e) \land \exists e' \ [e' \leq e \land |e'| \geq 1/2 \land e' \land \forall e'' \ [e'' \leq e' \rightarrow q(e'')]]]
\]

(38) can be paraphrased: There is a general (possibly plural) event \( e \) for which \( p(e) \) holds and there is a (possibly plural) event \( e' \) that is a major part of \( e \) such that, for all subevents
of \( e' \), \( q(e'') \) holds.

N&R suggest that the QV reading with respect to a given NP will be available where:

The semantic content and the thematic predicate of the NP are within the restrictor \( p \);
The general event \( e \) is « measured » by counting its atomic event units in \( V^0 \);
The NP is interpreted distributively in a one-to-one mapping.

(37) would be represented as in (39).

\[
39. \exists e \ [\text{*ADMIRE}(e) \land \text{AGENT}(e, \text{the students}) \land \exists e' \ [e' \leq e \land \left| e' \right| \geq 1/2] \land \forall \forall e'' [e'' \leq e' \rightarrow \text{THEME}(e'', \text{Mary})]]
\]

H&E extend and modify N&R to account for QVEs. It is commonly assumed that quantifiers come with covert domain restriction in the form of a free context variable (von Fintel (1994), Marti (2003)) which is added conjunctively to the overtly given predicate that functions as the first argument of the quantifier. E&H suggest that this is resolved to a predicate that locates the event at a time interval, as in (40). The tense specification in the restrictor cannot contradict the one within the nucleus.

\[
40. \text{MOST } e'' \ [e'' \in \text{ATOM}(\sigma \{ e : \text{AG}(e, \sigma \{ X : \text{PEOPLE}(X) \land \exists e' \ [\text{AGENT}(e', X) \land \text{LECTURE_ON_K}(e') \land \text{AT}(e', \text{CONF_LAST_S}) \land \tau(e') < t_0])\}) < \tau(e'') \land \tau(e'') \subseteq \iota_{e''}]}
\]

In the case of the restrictor, write E&H, the atoms of the plural eventuality are most plausibly determined via the atomic parts of the plural individual that functions as its argument. That is, we get the set of eventualities each of which has an atomic part of the plural individual denoted by the definite DP as its argument. In the case of the nuclear scope, the atoms have to be the smallest eventualities that fulfill the verbal predicate.
Chapter 3. Pair List Readings

Overview

Questions with quantifiers can be ambiguous. The question in (1a), for example, admits the three responses in (1b)-(1d), termed individual, functional and pair-list, respectively. (2) supplies the quasi-logical analysis usually assigned to the PL reading.

1. a. What did every girl see?
   b. Individual: Every girl saw Grace.
   c. Functional: Every girl saw her best friend.
   d. Pair-list: Annandi saw Bian, Chandi saw Dolores, Elara saw Francine.

2. “For every girl x: Who did x see?”

There are two principal puzzles with regard to PL readings – where they come from and, then, where they go to. That is, the challenge is to supply a representation/set of representations that delivers the three meanings and that then naturally lends itself to an explanation of the distributional facts. As we commented in Chapter I, PL readings have a much more restricted distribution than do functional readings or individual readings. For example, while the PL response to (1) is natural, the PL responses to (3a) and (4a) are infelicitous, as (3c) and (4c) show.

3. a. Who do most/several/(more than) two men love?
   b. Most/several/(more than) two men love their sister.
   c. % Abe loves Bedelia, Cam loves Dara . . .

4. a. Who does no man love?
   b. Addolorata
   c. His mother-in-law.
   d. % Abe does not love Bedelia, Cam does not love Dara, . . .
The rest of this chapter proceeds as follows. In Section 2 we supply a review of the literature on PLRs. Readers already familiar with this literature can safely skip this section. In section 3 we discuss the distribution of PLRs. In section 4 we motivate our analysis of PLRs as quantifying over events. In section 5 we offer two proposals for the semantics of PLRs, the first algebraic and the second dynamic. In section 6 we show how these proposals can account for many of the long-standing mysteries with regard to PLRs. Before proceeding, however, we offer a brief summary of our analysis.

Making temporary abstraction of the universal quantifiers, we observe that the quantifiers that permit PLRs share two characteristics: they are referential and complex -- **sums** in the vocabulary of Link. We then point out that, like quantified declaratives, quantified interrogatives permit both object- and event readings. Crucially, the truth conditions of the answer to a PL question are those of the statement’s event reading. This, we claim, motivates the treatment of PLRs as quantifying over events. We argue that individual, functional and PL answers result from quantification over variables of different types: d (individual), f (functional) and v (event), respectively. We then make two proposals for the semantics of PLRs. The first is algebraic; the second, dynamic. In both, the question operator is analyzed, essentially as an adverbial quantifier. Explanations of empirical phenomena associated with PLRs – the subject-object asymmetry and the fact that PL answers are exhaustive – are shown to fall out.

**Extant analyses**

(2) corresponds pleasingly to our intuitive understanding of the relevant meaning of (1a) and questions like it. The immediate problem is theory-internal. Quantification is defined for expressions that can be true and false, expressions of type ≪t≫. Questions, however, are of type ≪s <st>>. As is, (2) is inconsistent with the principle of compositionality, a theoretical primitive of formal semantics.

In summary, Engdahl replaces quantification over questions with quantification over functions: A natural function question asks what relation links each member of the subject set with the relevant member of the answer set; a pair-list is the actual-world spell-out of the function. In our example, “her best friend” names the function, and “Annandi saw Bian, Chandi saw Dolores, . . .” lists each member of the function domain with the element to which it is matched in the range. Groenendijk and Stokhoff suggest that PLRs involve quantification not directly over a question but over a subexpression of the proper type, <t>. It has also been suggested that it would be possible to quantify over a super-expression of type <t> (Karttunen). For his part, Chierchia suggests that PLRs be analyzed as second-order (raised) questions: a PL question is actually a set of questions, and the subject of each question is a “Witness” of the general quantifier.\textsuperscript{22} Krifka suggests that PLRs spell out the conjunction of a series of speech acts. The PL question is embedded under a silent performative operator, something like: I ask you what A saw and I ask you what B saw . . . Finally, Barss, Dayal and Hagstrom suggest that two strategies are available for the interpretation of questions, one that involves movement and another that leaves the wh-P in-situ.

The peculiarities of the distribution of PLRs – their chimeral character – can be made to fall out as follows. Chierchia: the quantifiers that give rise to PLRs form a natural class in that they all have unique witnesses. Krifka: what the quantifiers that give rise to PLRs have in common is that they involve conjunction only, as disjunction is not defined for speech acts. BD&H: Following Chierchia and Higginbotham and May, BD&H argue that PLRs require the “Absorption” of the wh-P into the QP, and Absorption, in turn, requires structural adjacency (movement).\textsuperscript{23} We explain each of these approaches in more detail in what

\textsuperscript{22} Chierchia (1997: 26) cites Barwise and Cooper (1981). B&C explain that every natural language quantifier “lives on” some set. Let $P_A$ designate the natural language quantifier $P$ that lives on the set A. A minimal witness set for $P_A$ is any set $B \subseteq A$ such that $B \in P$ and for no $P' \subseteq B$, $B' \in P$. So, the minimal witness set for $nX$ is always $nX$: the minimal witness set for (the value of) two ducklings is two ducklings; the minimal witness set for three swans is three swans, and so on. no $X$ and, indeed, all downward monotone quantifiers have a single witness set, the empty set. all $X$ also has a single witness set, the set of all Xs.

\textsuperscript{23} Absorption is a restructuring operation. In Chierchia (1997: 30) it is schematized as in (i).
follows.

**Engdahl: Quantification over functions**

Engdahl (1986) replaces quantification over questions with quantification over functions. In the functional analysis the quantifier does not scope out over the question – so the problem of quantifying into questions does not arise.

According to Engdahl (1986) the \(\text{wh-P}\) in questions like (1a) names a function from individuals to individuals, as in the paraphrase in (5a).

5. a. which function \(f\) is such that every girl \(x\) saw \(f(x)\)?
   b. answer: the best-friend function

More formally stated, \(\text{wh-Ps}\) introduce existential quantification over functions. The LF corresponding to (6a) is (6b) (I follow Preuss (2001), who intensionalizes Engdahl’s formulas). \(f_n\) is an \(n\)-ary function from \(n\) individuals concepts into individual concepts \(<(<\text{sd}>), \ldots,<\text{sd}>)\), \(<\text{sd}>>\). \(z\) and \(x\) are variables of type \(<\text{sd}>\).

6. a. Which wine did every customer order?
   b. \(\lambda p[\exists f_n [\forall z [\text{WINE}(f(z))] \& p(a) \land p=\lambda i[\forall x[\text{CUSTOMER}(x) \rightarrow \text{ORDER}(i)(x(i), f(i)(x))]]]]\)

If \(n=0\), \(f\) is a constant function. This yields the individual answer. In the case of *Which wine did every customer order?* \(F_0\) maps every world into Chardonnay in (7a); \(F_1\) is of type \(<<\text{sd}>, <\text{sd}>>\), and \(f_1\) maps the individual concept \(x\) is a customer into \(x\)’s favorite wine in (7b).

7. a. Chardonnay
   b. his favorite wine

---

(i) *Absorption*

\[
[wh \ N_i [NP_jS]] \rightarrow [[wh \ N_iNP_j]S]
\]
c. Anne ordered Chardonnay, Bill ordered Shiraz and Chris ordered Merlot.

Engdahl argues that the PL answer is a spell out of the members of \( f_i \) in the actual world \( a \). The difference between natural function answers like (7b) and pair-list function answers like (7c) is that the former name a function-in-intension, while the latter name a function-in-extension. Functions taken extensionally are lists, sets of ordered pairs. Thus, as Chierchia (1991, 1993) points out, if our domain set contains just three girls, A, C and E, and if B, D, and F are the best friends of A, C and E respectively, \{<A,B>, <C,D>, <E,F>\} describes the graph of the function "her best friend."

That functional readings are intensional means, among other things, that they may or may not pick out any individuals in the actual world. "A unicorn of her favorite color" picks out no individuals in the actual world, for example (Afërdita saw a purple unicorn, Brenna saw a black unicorn, . . .). In contrast, PL readings are extensional: they always pick out individuals in the actual world. While Engdahl’s approach very elegantly accounts for this, it cannot, at the same time account for the distributional facts. If the natural-function and the pair-list function answers had a common representation, we would expect the PL reading to be available wherever the functional reading is, contrary to fact (cf. the examples in (3)-(4) above).

**Groenendijk and Stokhoff: quantification over a subexpression**

Groenendijk and Stokhoff (1984) conclude, contra Engdahl, that the different answers correspond to three different translations. In G&S’s semantics interrogatives are translated into abstracts that express n-place relations, as in (8).

\[
\lambda w \lambda w' (\lambda x_1 \ldots x_n ( \theta (w',x_1 \ldots x_n))) = \lambda x_1 \ldots x_n (\theta (w,x_1 \ldots x_n)))
\]

The rule that accomplishes this translation defines a partition, grouping together those worlds in which the relation has the same extension. That is to say, questions are represented as equivalence relations on worlds. An equivalence relation holds between two worlds iff the extension of the relation in question is the same in those two worlds (G&S 2003: 51). Their translations of the three readings of Engdahl’s example -- *Which wine did
every customer order? -- are given in (9).

9. a. individual:
\[
\lambda i \left[ \lambda x \left[ \text{WINE}(a)(x) \land \forall a \left[ \text{CUSTOMER}(a)(y) \rightarrow \text{ORDER}(a)(y,x)\right]\right] = \left[ \lambda x \left[ \text{WINE}(i)(x) \land \forall a \left[ \text{CUSTOMER}(i)(y) \rightarrow \text{ORDER}(i)(y,x)\right]\right] \right]
\]

b. functional:
\[
\lambda i \left[ \lambda f \left[ \forall x \left[ \text{WINE}(a)(f(x)) \land \forall x \left[ \text{CUSTOMER}(a)(x) \rightarrow \text{ORDER}(a)(x,f(x))\right]\right] = \right] \left[ \forall x \left[ \text{WINE}(i)(f(x)) \land \forall x \left[ \text{CUSTOMER}(i)(x) \rightarrow \text{ORDER}(i)(x,f(x))\right]\right] \right]
\]

c. pair-list:
\[
\lambda i \left[ \forall y \left[ \text{CUSTOMER}(a)(y) \rightarrow \left[ \lambda x \left[ \text{WINE}(a)(x) \land \text{ORDER}(a)(y,x)\right]\right] \right] = \left[ \lambda x \left[ \text{WINE}(i)(x) \land \text{ORDER}(i)(y,x)\right]\right] \right]
\]

Here, quantification over individuals produces the individual reading and quantification over functions produces the functional reading. This is as in Engdahl’s system. Unlike Engdahl, however, G&S assign questions a third translation. Quantification over a subexpression of the question produces the PLR.

**Karttunen: quantification over a super-expression**

Karttunen (1977) opts instead for quantifying over a superexpression of the question denotation. He assumes that direct questions are analyzed as complements of silent performative verbs and that the universal quantifier quantifies in the matrix clause. As summarized in Szabolcsi (1996), in (10) P is a set of properties – like being known to John – such that for every dog y, the set of true answers to the question who y bit has those properties.

10. \[
\lambda P \forall y \left[ \text{DOG}(y) \rightarrow P(\lambda p \exists x[p \land p =^\sim (y \text{ BIT } x)]) \right]
\]

I ask which boy every dog bit.
\[
\forall x \left[ \text{DOG}(a)(x) \rightarrow \text{ASK}(\lambda \text{BOY}(a)(y) \land p(a) \land p =^\sim \lambda i \text{BITE}(i)(x,y))\right]
\]
The weakness of this approach, according to Szabolcsi, is that it will not account for what happens to PLRs in embedded questions. A PLR cannot be (further) embedded under a performative verb:

11. Which grade every student got depended on how well they did on the final.

**Chierchia: Weak crossover and witness sets**

1.2.4.1. The subject-object asymmetry

The puzzle in Chierchia (1991) is why, while questions like (12a) with quantified subjects admit functional and pair-list readings, questions like (13a) where the object is quantified do not.

12. a. Who/which professor does everyone like?
   b. Individual answer: Professor Smith.
   c. Functional answer: The one that looks like his or her favorite muppet.
   d. Pair-list answer: Bill likes Professor Smith, Sue likes Professor Jones . .

13. a. Who/which professor likes everyone?
   b. Mary.
   c. %The one that looks like each [liked] person’s favorite muppet.
   d. %Professor Smith likes Mary, Professor Jones likes Paul . .

Chierchia, like Jacobson (1994), argues that the difference is attributable to Weak Crossover. WCO describes a situation in which one element – who in (14a) -- crosses over another – his -- with which it is coindexed. It is common to attribute interpretive gaps, such as those observed in (14a) and (15a) to WCO. (14a) and (15a) do not admit the interpretations (14b) and (15b). In order to bind the element to which it is linked anaphorically, the antecedent – the wh-word in (14) and the quantified NP in (15) – would have to cross over its would-be bindee, which is generally thought to be impossible. (16) and (17) illustrate the illicit crossover configurations for (14) and (15), respectively.
14. a. **Who**\(_i\) does [**his**\(_i\) mother] love \(t_i\)?
   
b. % For which \(x\), \(x\)’s mother loves \(x\)?

15. a. **His**\(_i\) mother loves **everybody**\(_i\).
   
b. % For every \(x\), \(x\)’s mother loves \(x\).

16. \([cp[who],[does [his\(_i\) mother love \(t_i\)]]]\]

17. \([np[everybody], [his\(_i\) mother loves \(t_i\)]\]

Chierchia argues that the *wh*-P in functional readings contains a silent pronomial element just like *his* does. Following Engdahl (1986) and Groenendijk and Stokhoff (1984), Chierchia understands a question like (18a) as asking for a function, somewhat in the manner of the paraphrases in (18b and c). Crucially, this function is parameterized (Skolemized): the *wh*-word is associated with two objects, a function and an argument.

18. a. Who/which person does every Italian male love?
   
b. which function \(f\) is such that every Italian \(x\) loves \(f(x)\)?
   
c. which function \(f\) makes the following true: for every Italian \(x\): \(x\) loves \(f(x)\)

A *wh*-word, writes Chierchia, leaves behind a complex trace, doubly indexed as in (19b), where the subscript corresponds to the function and the superscript to its argument. The former is bound by the *wh*-P in Comp and functions like any other *wh*-trace; the value of the latter is determined by coindexing with a c-commanding NP and behaves like a bound pronominal.

19. a. Who does every Italian love?
   
b. [who, [every Italian, loves \([e^i]\)]]

The functional/pair-list reading is unavailable in (20a) because the structure that would have generated it constitutes a case of WCO. Whereas in the licit (19b), the QNP c-
commands the \textit{wh}-trace from its base position, in (20b) the object NP is not a proper antecedent for the a-index. \textit{Everyone}, as a quantifier, could be raised of course, but then it would crossover the co-indexed \textit{wh}-trace, illicitly. So, \textit{Who likes everyone?} lacks a functional reading for the same reason \textit{His mother likes everyone}, (20c), lacks a bound reading.

20. a. Who likes everyone?
   b. who\textsubscript{i} [e\textsubscript{j}] likes everyone\textsubscript{j}
   c. His\textsubscript{i} mother likes everyone\textsubscript{i}

Dayal (1996) offers strong empirical support for the WCO thesis. She points out that in languages in which scrambling ameliorates WCO violations, it is possible to get a universal reading for the scrambled object.

That said, there are also empirical arguments for rejecting the WCO thesis. First, according to Beghelli (1997), in English there are quantifiers, like \textit{each}, that allow PLRs, cf. (21a-b), but lead to violations in standard WCO configurations.

21. a. Which guest made each dish?
   b. The pasta was made by Al; the salad by Bill; and the pudding, by Carl.
   c. *His\textsubscript{i} mother loves each person\textsubscript{i}.

Second, as Preuss (2001) points out, there are languages that exhibit subject-object asymmetries in PLRs but do not exhibit WCO effects. In German, for example, the binding configuration in (22) is allowed. (Preuss 2001:48-9, citing Chierchia 1993: 223fn32)

22. Jedn Mann\textsubscript{1} mag seine Mutter \textsubscript{t\textsubscript{1}}.
   every man\textsubscript{1} likes his\textsubscript{1} mother
   “Every man\textsubscript{1} is liked by his\textsubscript{1} mother.”

\textbf{Generalized quantifiers over questions}

The foregoing goes to explain the subject/object asymmetry. In order then to explain why
pair-list readings should be available with only a limited set of quantifiers, Chierchia follows and amends Groenendijk and Stokhoff (1984). He analyzes questions as generalized quantifiers over questions and pair-list readings as involving interpretation with witness sets. We review this section in some detail because we will follow Chierchia in this regard, in sections 4 and 5, we too analyse PL questions as GQs over questions.

According to Chierchia, the difference between the individual reading of a question on the one hand and its functional and pair-list readings on the other is that in the first case we have a simple trace while in the second case the trace is complex. The difference, then, between functional and pair-list readings is that in the case of the natural-function reading only the domain of the function is semantically determined, while in the case of the pair-list reading, both the range and the domain are. Thus the functional reading of *Which professor does every student like?* calls for a professor-valued function without necessarily imposing any restrictions on the domain of the function. The pair-list reading of the same question calls for a function that explicitly pairs a student $x$ with a professor $f(x)$.

Following Higginbotham and May (1981), Chierchia hypothesizes that the process by which domain restriction comes about is absorption. Absorption can be thought of as a restructuring operation: the NP subject is rebracketed with the raised *wh*-expression. This is schematized in (23).

$$\text{23. } [\text{wh } N_i [\text{NP}_j S]] \Rightarrow [[ \text{wh } N_i \text{NP}_j]S]$$

Where absorption takes place, interpretation makes use of witness sets. The particularities of witness sets, then, account for the limited distribution of pair-list readings. The quantifiers that support pair-list readings -- *every, all, the (two), both* -- differ from those that don’t -- *no, at most (two), few, many, neither, a, some* -- in that they have unique, non-empty witness sets.

Chierchia points out that sets of questions like this can be expressed equivalently as sets of sets of questions, or generalized quantifiers over questions. He suggests uniformly lifting
all questions to this higher type. Thus, the three-ways ambiguous question (24a) will be associated with the three different LF’s in (24b, c, and d), corresponding to its individual, functional, and pair-list readings, respectively.

24. a. Which professor does every student like?
   b. Individual: \( \lambda PP(\lambda p \exists x \text{PROFESSOR}(x) \land P = \forall y[\text{STUDENT}(y) \rightarrow \text{LIKE}(x,y)]) \)
   c. Functional: \( \lambda PP(\lambda p \exists f \forall x(\text{PROFESSOR } f(x)) \land P = \forall y[\text{STUDENT}(y) \rightarrow \text{LIKE}(y,f(y)]) \)
   d. PL: \( \lambda P \exists A[W(\text{EVERY STUDENT}, A) \land P(\lambda p [\exists f \in [A \rightarrow \text{PROFESSOR} ] \exists x \in A[p=\forall \text{LIKE}(x,f(x))])] \]

In (24d) \( W \) stands for “is a witness set of.” Groenendijk and Stokhoff first employed witness sets in order to avoid a problem that surfaced with Karttunen’s analysis which interprets the NP complement of the quantifier \( de re \). The alternative they suggest is to take the quantifier to determine a set (a witness set) that restricts the domain of the question.

Every natural language quantifier \( P \) “lives on” a set \( A \). (\( P \) lives on \( A \) iff the intersection of \( A \) with any subset of \( P \) is an element of \( P \)). This set is designated \( P_A \). Every \( P \) has one or more minimal witness sets. A subset \( B \) of \( A \) is a minimal witness set for \( P_A \) if \( B \subseteq P \) and for no \( P' \subseteq B, B' \subseteq P \). For example, the quantifier three witches lives on the set of witches and any subset of the set of witches containing three members will constitute a minimal witness set of three witches. Every pointed hat has a unique witness set – the set of pointed hats. No cauldron – indeed, any downward monotone quantifier – also has a unique witness set, the empty set.

G&S invoked witness sets to account for the choice reading of questions like Who do two men like? Here, an answer that names who any set of two men likes is a complete answer. G&S suggest analyzing (25a) as a family of questions, each about a different witness set of two men, somewhat as in (25b).

25. a. Who do two men like?
Szabolcsi: PLRs in the complements of extensional predicates

In analyses like those summarized above, the quantifier in a PLR does not have its standard quantificational force. Rather, it contributes a restriction on the domain of the question. Further, it is assumed that the interrogatives are lifted, denoting GQs over individual questions. Szabolcsi argues against this approach, in part on empirical grounds. She suggests that some questions -- matrix questions and complements of wonder-type verbs, as in (26a) -- involve domain restriction but no lifting, while others -- complements of find out-type verbs, as in (26b) -- involve lifting but the quantifier acts in its usual manner.\(^\text{24}\)

\([27]\) corresponds to the first, \([28]\) to the second.

26. a. I wonder which girl shot which unicorn.
   Many people insist Tupac, like Elvis, is still alive.

   b. Raphael found out which girl shot which unicorn.
   Many people know that Tupac, like Elvis, is still alive.

27. \(\text{WHICH } x \in A, \text{ WHICH } y [x \text{ SHOT } y]\)
   where \(A\) is the unique set determined by the quantifier
   only universal quantifiers -- intensional

28. \(\lambda P[Q(\lambda x[P(\text{WHICH } y[x \text{ SHOT } y])])]
   \) almost any quantifer -- extensional

Szabolcsi argues that the witness structure is empirically inadequate in that it cannot account for domain restriction with non-upward monotone quantifiers nor can it explain "scope-out." That is, it cannot explain why every can take wide scope (WS) in \([29a]\) when it has narrow scope (NS) in \([29b]\).

\(^{24}\) Lifting is strictly necessary only where \(Q\) has no unique true answer.
29. a. Some librarian or other found out which book every student needed.
   a’. [which book every student needed], [some librarian found out \( t_i \)]
   b. Some librarian or other found out that every student needed help.

Szabolcsi suggests that the complement clause with PLR is assigned scope over matrix subject clause-internally. The complement interrogative on its PLR inherits the semantic properties of its internal WS \( Q \). This is illustrated in (30a-c). Here, the result is a one-to-one function from boys to questions.

30. a. I found out which book every boy needed.
   b. which book \( D \) boys needed
   c. \( D \) questions such that for some boy \( x \) the question is which book \( x \) needed

According to Szabolcsi, quantifiers fall into two main categories. The first includes universals and bare numeral indefinites. These introduce discourse referents. In the case of universals the referent is the unique witness of the quantifier; in the case of indefinites, it is a plural individual whose atoms are the elements of a unique witness. In both cases the referent is associated with a distinct distributive operator. (31) supplies an example. In contrast, the quantifiers in the second category, modified numerals and other decreasing items, perform a counting operation on a predicate denotation, in the manner of GQs, as (32) shows.

31. a. who every dog bit
   b. \( \lambda P \exists \exists A[\text{WITNESS}(A,[[\text{GQ}]]) \land \forall \forall x[x \in A \rightarrow P(\text{WHOM } x \text{ BIT})]] \)

32. a. who more than six dogs bit
   b. \( \lambda P \text{MORE-THAN-SIX } x[\text{DOG}(x), P(\text{WHO } y[x \text{ BIT } y])] \)

**Krifka: PLRs as conjoined questions acts**

Krifka (1999, 2001) analyzes pair-list questions as conjoined question acts. A question like *Who brought what?* is analysed as the consecutive performance of two speech acts. Krifka
points out that negation and disjunction are not defined for speech acts and that, for this reason, speech acts do not present a Boolean algebra. If the pair-list reading is exceptionally available in questions embedded under verbs of the find out class, Krifka hypothesizes that this is because these verbs initiate a systematic meaning shift of the embedded question from a question act to the sum of the propositions that are answers to it. All Boolean operations will be defined under this sum. PLRs of matrix questions and questions embedded under intensional predicates are analyzed as conjunctions of question speech acts.

Krifka points out that speech acts in general can be conjoined. We can, for example, conjoin assertions, questions, commands, exclamations, baptisms, curses and more, as the examples in (33) show.

33. a. My dog loves chicken soup. And my cats likes chopped liver.
    b. Which dish did Al make? And which dish did Bill make?
    c. Eat the chicken soup! And drink the hot tea!
    d. I hereby baptize you John. And I hereby baptize you Mary.

Disjunction, however, is not defined for speech acts.25 Disjunction seems to take scope under the speech act: So Pick up the ball or pick up the racket is interpreted Act to make true: you pick up the ball or you pick up the racket. Here or disjoins the underlying propositions, not the commands. It is not the speech act which is disjoined. This seems to be the pattern with all varieties of speech acts. I hereby baptize you John, or I hereby baptize you Mary is not a proper baptism. Assertions are no exception. Al made the pasta, or Bill made the salad, for example, is equivalent to I assert: Al made the pasta or Bill

25 This is not, however, an uncontroversial claim. Belnap and Steel (1976) accept disjoined questions like the one in (i).

(i) Have you ever been to Sweden or have you ever been to Germany?

According to Szabolcsi, in examples like (i), or revokes the first question and replaces it by the second. Krifka, however, observes that the addressee does not actually have the choice of answering one question or the other. If the addressee has been to Sweden and to Germany, I have been to Sweden is an incomplete answer. The question only admits a yes-no answer.
made the salad and not I assert: Al made the pasta, or I assert: Bill made the salad.

Syntactic forms that look like disjunction of two speech acts typically are interpreted in special ways. For example, the disjunction may be lowered to the propositional level or the second disjunct may be interpreted as a replacement of the first, cf. footnote 13.

Krifka concludes that speech acts do not form a Boolean algebra, that they involve a semi-lattice at most. This explains the exceptional behavior of universal quantifiers in PLRs. Universal quantifiers can scope out of commands baptisms and curses and other speech acts, as in (34).

34. a. Confiscate every book /most books on dinosaurs!
   b. I hereby baptize every one of you / most of you John.
   c. Every one of you is a crook! (a possible curse)
   d. Most of you are crooks! (a description, not a curse).

Krifka points out that universal quantifiers are generalized conjunctions, whereas other operators cannot be reduced to conjunction but involve operations like disjunction or negation, as (35) illustrates.

35. a. Every guest came Al came and Bill came and Carl came
   b. A guest came Al came or Bill came or Carl came
   c. No guest came Not: Al came or Bill came or Carl came
   d. Most guests came Al came and Bill came or
      Al came and Carl came or
      Bill came and Carl came

Non-universal quantifiers cannot move out of speech acts because they cannot be interpreted in terms of speech act conjunction alone. They require disjunction as well; however, speech act disjunction is not possible, as (36) shows.

36. a. Which dish did two boys make?
b. Which dish did Al make and which dish did Bill make or which dish did Bill make and which dish did Carl make or which dish did Al make and which dish did Carl make?

Krifka assumes, following Searle, that an illocutionary operator combines with a sentence radical (generally, i.e. in the case of assertions or commands, a proposition). OP will be a function from \( p \) to \( a \) (\( a \) the type of speech acts). In the case of questions, the relevant OP – \( \text{QUEST}’ \) – is type \( <<\text{pt}>a> \). Speech act coordination is type \( <\text{aaa}> \) – with type-lifting operations available. \( \& \) is speech act conjunction, defined as consecutive performance. So, in (37), for example, \( \text{Every boy} \) is interpreted as a quantifier that scopes out of speech acts, type \( <<\text{da}>a> \). \( \&A \) stands for the conjunction of all speech acts in a set of speech acts \( A \). We get the conjunction of speech acts of the form \( \text{Which dish did } y \text{ make} \) where \( y \) varies over boys. \( \text{Which dish did every boy make?} \) then would be understood as in (37).

\[
37. \quad ([\text{every boy}]_1[\text{QUEST}[\text{which dish } t_1 \text{ made}]])
\]

Which did did Al make and
which dish did Bill make and
which dish did Carl make?

\[
[\text{every boy}]_1\lambda t_1[\text{QUEST}(\text{which dish } t_1 \text{ make})]
\]

\[
\lambda P[&\{P(y) \mid \text{BOY}(y)\}] \quad \lambda y[\text{QUEST}(\lambda p \exists x[\text{DISH}(x) \land p = ^\text{MADE}(x)(y)])]
\]

\[
\&\{\text{QUEST}(\lambda p \exists x[\text{DISH}(x) \land p = ^\text{MADE}(x)(y)] \mid \text{BOY}(x)\}
\]

Krifka analyzes definite plurals as sum individuals. Krifka illustrates with the example in (38), \( \text{Which dish did Al and Bill make?} \) Krifka assumes \( \text{Al and Bill} \) raises, forming a lambda-abstract, as in (38a). As immediately above, in (38) \( \text{QUEST} \) stands for the syntactic realization of the questions operator; it is of type \( <<\text{pt}>a> \), i.e. it maps a question radical to a speech act. In (38b) \( \text{Al and Bill} \) are type-lifted; \( A \) and \( A’ \) are variables over type \( <<\text{da}>a> \), the type of the raised \( \text{Al and Bill} \). The application of the conjunction to the question abstract yields a set of questions, where each element of the conjunction is taken in turn as the value of the abstracted position.
38. Which dish did Al and Bill make?
   a. $[\text{Al and Bill}]_1 \lambda t_1 [\text{QUEST}(\text{which dish did } t_1 \text{ make})]$
   b. $\lambda P[P(\text{Al})] \lambda A \lambda A' \lambda P[A(P) \& A'(P)] \lambda P[P(\text{Bill})]$
   c. $\lambda P[P(\text{Al}) \& P(\text{Bill})] \lambda y [\text{QUEST} (\lambda p \exists x [\text{DISH}(x) \land p = ^\text{MADE}(x)(y)])]$
   d. $\text{QUEST} (\lambda p \exists x [\text{DISH}(x) \land p = ^\text{MADE}(x)(\text{Al})]) \&$
      $\text{QUEST} (\lambda p \exists x [\text{DISH}(x) \land p = ^\text{MADE}(x)(\text{Bill})])$

Barss, Dayal, Hagstrom: Interrogative quantification over existential CFs

Barss (2000), Dayal (2002) and Hagstrom (1998) argue that there are two independent mechanisms for interpreting $wh$-in-situ, one that yields list readings but relies on movement and another that does not rely on movement but yields only single pair readings. All require sometimes covert movement of the $wh$-P into a structurally higher scope position. Where the $wh$-word is trapped in an island this movement is impossible and no list reading results. Interpretation, rather, involves choice functions.

Barss explains that in classical Government and Binding (GB) (e.g. Chomsky (1976, 1977, 1981)) - all $wh$-expressions move to an A-bar (operator) position (the specifier of a $[+wh]$ C – (e.g. May (1985)) before LF. The $wh$-expression is interpreted as a restricted interrogative quantifier, its logical scope identified with its c-command domain and the lowest trace it binds interpreted as a logical variable whose value is to be specified by the answer to the question. The $wh$-Criterion forces each overtly in-situ $wh$-expression to raise covertly (cf. Rizzi 1990). Semantically, the LF position of the $wh$-P corresponds to its scope position.

26 Krifka’s explanation of the difference in the availability of PLRs in the complements of extensional and intensional predicates is that only the latter embed true speech acts; the former actually embed objects of a different sort, viz., question radicals. Krifka assumes a type-shifting operator TA that, when applied to a question act, yields the propositions that are true answers to that question.

Krifka accounts for the lack of PLRs with non-universal quantifiers as follows. He points out that quantifier raising is cyclic. It is generally assumed that a quantifier must be interpretable at every landing site. In (i), the hypothetical LF for the nonexistent PLR, the quantifier would not be interpretable in the intermediate landing site.

(i) $[[\text{most boys}][\text{Doris wonders}][t_i [\text{QUEST} [\text{which dish } t_i \text{ made}]]]]$
It has long been thought that *wh*-movement is a syntactic solution to a semantic problem – for a *wh*-word to be interpretable it must be split across two positions (just as a quantifier must), one serving as the operator and the other as a variable. By hypothesis all *wh*-words move to create this operator-variable structure whether or not this movement has phonological exponence. The problem is that if we want to posit that *wh*-words that do not move overtly do move covertly we need to maintain that covert movement is not subject to the same constraints that overt movement is.27 Alternatively one can abandon the movement hypothesis and suppose that *wh*-in-situ can be interpreted without movement – as are wide-scope-taking indefinites (*someone, a student*) (Reinhart 1997, Winter 1997, Kratzer 1998, Matthewson 1999, Romero 1999).

Pesetsky (1987) and Reinhart (1993, 1995) proposed that some *wh*-expressions are interpreted in-situ. D-linked *wh*-Ps can remain in-situ at LF and are interpreted via interrogative quantification over existential choice functions. Reinhart translates (39a) as (39b).

39. a. Who admires which former US president?
   b. [which *x*: human(*x*)][which *f*][*x* admires *f*(former US president)]

The NP, *former US president* denotes the relevant set and the determiner which is interpreted as a variable over choice functions taking the NP denotation as its argument. Thus the question asks for the identity of two things -- a person and a function such that the former admires the output of applying the latter to the set of US presidents. Identification of the output of the function is sufficient to distinguish that function from all others. The interrogative operator *which f* is introduced in the LF component at the CP level via a sort of existential closure, so no movement is involved.

---

27 This is a common but not uncontroversial assumption. Manuel Español-Echevarría (p.c.) points out that Huang (1982) and Boscovic (1997), among others, assume covert movement is not in fact subject to the same constraints as overt movement.
Barss argues that there are two semantically and syntactically distinct operations for interpreting \textit{wh}-in-situ. First, the \textit{wh}-P can be raised to <Spec, C> at LF and interpreted via quantification over objects satisfying the non-\textit{wh} part of the phrase. Second, the \textit{wh}-P can be left in-situ and interpreted via quantification over choice functions whose argument is the set denoted by the non-\textit{wh} part. The first mechanism is subject to island constraints; the second is constrained in the form of \textit{wh}-expressions it can apply to. Only LF-displaced \textit{wh} can undergo absorption. According to May (1990) and Higginbotham (1993) structural adjacency (defined as mutual m-command in May (1985, 1989) is a syntactic precondition for absorption. Absorption is sufficient and neccessary for multiple-pair interpretation. Absorption creates a complex n-ary quantifier within which the original restrictions on the unary quantifiers are conjoined as a complex restriction and to which all variables bound by the input quantifiers are bound. Absorption is further restricted to operators over elements of the same type: operators over elements of different types cannot undergo absorption.

**Lahiri: A Boolean algebra for answers**

Recall that many of the quantifiers that support natural function readings do not support PL readings.

40. a. Who do most/several/(more than) two men love?
   b. Most/several/(more than) two men love their sister.
   c. %Abe loves Bedelia, Cam loves Dara . . .

Curiously, while PLRs with quantifiers like those in (40) are not available in matrix questions and in the complement of intensional (\textit{wonder}-type) verbs, they are available in the complement of extensional (\textit{find out}-class) verbs, as (41) shows (cf. Szabolcs 1997).

41. a. Jayani \textit{wonders} what several girls saw.
   b. %Jayani \textit{wonders} if Alaia saw “Amores Perros” and if Beatrice saw “Invasiones Barbares” and if Carmen saw “Chung King Express.”
   c. Jayani \textit{found out} what several girls saw.
   d. Jayani \textit{found out} that Alaia saw “Amores Perros,” Beatrice saw “Invasiones Barbares” and Carmen saw “Chung King Express.”
Lahiri (2000) proposes a solution to this puzzle in the context of his account of Quantificational Variability Effects (QVEs). QVE, Lahiri argues, involves quantification over parts of answers. An answer, writes Lahiri, is some conjunction of elements in the (Hamblin) question denotation, as in (42). Answers to questions have a natural part-whole structure.

\[ \text{ANS}(p, Q) \text{ iff } \exists S \in \text{POW}(Q) [p = \cap S] \]

According to Lahiri, the interrogative complements of wonder-type verbs are interpreted in-situ. These verbs are of type <<<st>t><dt>>: they relate individuals and interrogatives irreducibly. know-type verbs, in contrast, are of type <<<st><dt>>: they take a proposition as an argument. The complements of know-type verbs undergo Interrogative Raising. IR is a translation that type-shifts the question that the interrogative denotes to a sentence which contains a propositional variable mediated by the answerhood relation. This sentence is the restriction of the adverb of quantification. Both the restrictor and the nuclear scope must be predicates either both of propositions or both of questions, as in (43).

\[ \text{John knows, for the most part, Q: } \]
\[ \text{MOST}_p(\lambda p[\text{ANS}(p, Q) \land C(p)])(\lambda p[\text{KNOW}(p)(j)]) \]

It is a type mismatch which forces interrogative raising. While predicates of the wonder class denote functions that take questions as arguments, predicates of the know class do not. The former are of type <<<st>t><dt>>; the latter, type, <<<st><dt>>. Interrogative Raising (IR) may be to either IP or VP. Raising to IP puts the question into the restrictor of the adverb of quantification. Raising to the VP puts it in the nuclear scope. This occurs if the question is focused.

This completes our review of the literature. We turn now to our own analysis.
Distribution: What quantifiers permit PLRs?

All those to have investigated PL readings seem to agree that questions with universal terms – *every, each* – allow PLRs and that questions with *no* do not. There is no consensus with regard to other quantifiers. The status of plural definites and numerals, in particular, is a matter of debate. In G&S's catalogue, *the, the two, both and all the* figure with *every* and *each* -- all allow PLRs. *Any, few, many, most, two, at least two, at most two, exactly two* figure with *no* -- they do not allow PLRs.

Krifka (1992) and Srivastav (1992), however, argue that plural definites, not being quantificational, do not undergo QR and thus cannot give rise to genuine PL readings. They argue that the “apparent” list reading of (44a) is not genuinely distributive, as PL readings generally are. What we have in (44b) is not a PL reading but the spell-out of the cumulative reading of the question. (44b) is “overinformative”: the normal response would simply list the plurality of movies rented by the boys.

44. a. Which movie(s) did the boys rent last night?
   b. John rented “Wings of Desire,” Peter rented “City of Sadness” and Carl rented “Stranger than Paradise.”

The status of numerals, too, has been a subject of debate. Numerals, argue G&S, give rise to a "choice" reading. For example, G&S interpret *Who did two dogs bite?* as asking for a list of the people that any set of two dogs bit.

It is not clear, however, whether choice readings are appropriately analyzed as PL. Szabolcsi writes that to the extent that sentences like *Who did two dogs bite?* are acceptable they are an instance of something else. She points out that sentences of this form in Dutch, like (45), do not have a choice reading.

45. Welk boek lazen twee jongens?
   What book read two boys
   “What book did two boys read?”
What did A read? AND what did B read?

We believe that the distinction between PL readings on the one hand and “overinformative” and “choice readings” on the other is motivated not by interpretive differences but by explanatory challenges. Krifka and Dayal make use of QR to derive PL readings. How can QDPs give rise to PLRs if they are not subject to QR? Our analysis circumvents this problem because it does not rely on QR. Like G&S, we will argue that plural definites do indeed give rise to PL readings and that numeral quantifiers don’t.

Making abstraction of the universal quantifiers (every, each) for a moment, we observe, first, that in those cases in which a PL reading is available the QP is, arguably, referential and not genuinely quantificational. The quantifiers that permit PLRs pick out individuals in the actual world. In (46a), for example, the would not be felicitous if two girls did not have a common referent for both speaker and hearer. In (46a), as in (46b), we have not a Generalized Quantifier (GQ) over individuals, type <<dt><t>>, but a plural individual, type <d>.

46. a. Who did the two girls see?
   b. Who did Maitri and Jayani see?

47. a. Who did more than two girls see?
   b. Who did most girls see?

The behavior of a QDP in a sentence with a potentially distributive predicate provides another test. Distribution is not possible with quantitative DPs. Thus, if a distributive reading is possible in a sentence with a QDP, that QDP is arguably not quantificational. Each and respectively test for distributivity (Schwartzschild 1990). In (48) we see that the two girls and Maitri and Jayani combine unproblematically with each, while the quantitative few girls and most girls do not.

48. a. The two girls each saw Michael.
b. **Maitri and Jayani** each saw Michael.

c. %**Few girls** each saw Michael.

d. %**Most girls** each saw Michael.

49. a. **The two girls** saw Michael and Adrian *respectively*.

   b. **Maitri and Jayani** saw Michael and Adrian *respectively*.

   c. %**Few girls** saw Michael, Jarrah and Adrian *respectively*.

   d. %**Most girls** saw Michael, Jarrah and Adrian *respectively*.

That said, not all referential DPs give rise to PLRs. Consider (50). Although the subject is referential no PLR is available: (50b) is not a possible answer to (50a). At issue is not who the different members of the committee may have recommended to the committee, but rather who the committee recommended (to some other body). In (50a), unlike in (50c), the units in the entity to which the DP refers aren’t visible or accessible.

50. a. Who did **the committee** recommend?

   b. %Adelgund and Barbara recommended Yolanda, and Collette and Damian recommended Zoe.

   c. Who did **the four members of the committee** recommend?

   d. Adelgund and Barbara recommended Yolanda, and Collette and Damian recommended Zoe.

In (50a), the predicate cannot distribute down to the units of **the committee**. Even in a situation where both speaker and hearer know that A, B, C and D are the members of the committee, (50b) is not a possible answer to (50a).

**The committee** is different from **the girls** in that the latter is plural (complex) and the former is atomic. The members of a committee can change in the course of time or vary from meeting to meeting, the committee as an entity remains the same (Dobrovie-Sorin and Mari 2006). It exists as an entity over and above the sum of its parts. In the vocabulary of Link (1983, 1984), **the committee** is a group; **the girls** is a sum. (51) gives the representation of
the two girls.

\[ \sigma^* \{ x \in \text{GIRL}: |\text{GIRL}| = 2 \} \]

**Motivating an event analysis of PLRs**

We argue that individual, functional and PL answers result from quantification over variables of different types: \( d \) (individual), \( f \) (functional) and \( v \) (event), respectively. In this section we motivate our claim that it is quantification over events that yields PL readings. The argument runs as follows: We establish that it is possible and useful to analyze sentences as quantifying over events. We point out that, just as quantified declarative sentences may have two readings, object- (or individual-) related and event-related, so, too, may quantified interrogative sentences. We show that the PL answer of a quantified interrogative has the truth conditions that correspond to the event reading.

**Object and event readings of quantified declaratives**

Krifka observes that quantified statements like (52) may be ambiguous between an individual reading and an event reading (Krifka 1990: 487).

\[ 4000 \text{ ships passed through the lock last year.} \]

The most readily available reading of (52) is its object-related reading: there are 4000 different ships that passed through the lock. One or more of the ships may have passed through the lock several times: it remains the case that 4000 ships passed through the lock. (52) also has an event-related reading: there were 4000 passings of ships through the lock. On this reading, it is possible that there were far fewer than 4000 ships that passed through the lock: one or more ships may have gone through the lock one or more times. The sentence is still true in the limit case where one ship passed through the lock 4000 times. Individual and event readings do not have the same truth conditions. Event-related readings but not object-related readings allow what Doetjes and Honcoop (1996) call the recycling of individuals. That is, event-related readings may count one individual twice or more; object-related readings do not. We will see that PL answers recycle individuals.
Object and event readings of quantified interrogatives

We said in Chapter II that to know the meaning of a declarative is to know what would have to be the case for it to be true, while to know the meaning of a question is to know what would count as an answer to it (G&S 2003). In the case of declaratives we ask whether a sentence would be judged true given a certain state of affairs. In the case of questions, the test is whether a sentence would be accepted as an appropriate answer given a certain state of affairs.

To persuade yourself that there may be distinct object and event answers to a question, consider a situation like the one in (53).

53. Situation: There are three ships. Ships A and B each made one passage through the lock. Ship C made two. Their cargo was:

- Ship A: Plastic flip flops, MP3 players, medical waste
- Ship B: Plastic flip flops, MP3 players, GM soybeans
- Ship C voy.1: Plastic flip flops, MP3 players
- Ship C voy.2: Plastic flip flops

Given this state of affairs, (54a), *What did every ship transport through the lock?* admits two different responses. The individual answer, (54b), identifies two items. There are two individuals such that they were carried by every ship: plastic flip flops and MP3 players. The event answer, (54c), identifies only one item. There is only one individual such that it was transported in all events of ship-passing: plastic flip flops.

54. a. What did every ship transport through the lock?
   b. Individual answer: Plastic flip flops and MP3 players.
   c. Event answer: Plastic flip flops.
To persuade yourself that the PL answer corresponds to the event answer, consider a situation like this one:

“224 Sequoia” is a small, three-floor apartment complex with a common garden. The tenants all have their own individual vegetable plots, but the flower area is tended (or not) by all. This spring in the flower area, tenants planted various annuals: the third-floor tenants planted marigolds; the second-floor tenants planted pansies; (the first-floor tenants, for their part, just wrapped an ugly tapestry around the branches of the hawthorn tree that the third floor tenants had pruned with much pain and suffering). There are no other tenants.

What, given this state of affairs, are the possible answers to the question, What did the tenants plant? “Marigolds and pansies” is one possible answer. “Annuals” is also a possible answer. Both are “thing(s) x such that the tenants planted x.” Another possible answer is, “The third-floor tenants planted marigolds and the second-floor tenants planted pansies.” Critically, one answer that is not possible is “The third-floor tenants planted annuals and the second-floor tenants planted annuals.” Our informants did not spontaneously volunteer this as a possible response given this state of affairs. The PL answer is a set of answers; the set has as many members as there are events. In this case we have two planting events: an event of planting marigolds and an event of planting pansies. The PL answer names them both. While it is true that, viewed synthetically, one might say that we have two annuals-planting events, the event question is not synthetic in this way.

We elaborate this point a little more formally in (55) - (56).

---

28 Bernhard Schwarz (p.c.) points out that the claim made here is quite strong, perhaps too strong. We assert that the PL reading of a question is its event reading.

29 Resemblance to real-world events is entirely intended.

30 We think “Marigolds and pansies” is better understood as an abbreviated event response, but we don’t want to clutter the argument at this point.
55. Situation: There are three ships, A, B and C. A and B each made one passage through the lock; C made two. Their cargo was:

- Ship A: Plastic flip flops
- Ship B: Plastic flip flops
- Ship C, voy. 1: Plastic flip flops
- Ship C, voy 2: GM soybeans

56. a. What did every ship carry?
   b. Every ship carried flip flops.
   c. Every ship carried flip flops and one of them also carried genetically modified soybeans.
   d. Ship A carried plastic flip flops; ship B carried plastic flip flops; and ship C carried plastic flip flops.
   e. Ship A carried plastic flip flops; ship B carried plastic flip flops; ship C carried plastic flip flops and genetically modified soybeans.

Now, (56b) is a complete answer to (56a): Every ship did indeed carry flip flops. (56d) conveys the exact same information PL-style: *Ship A carried plastic flip flops; ship B carried plastic flip flops; and ship C carried plastic flip flops.* (56d), however, is not a complete answer. A complete PL answer would include the information that ship C also carried GM soybeans, as in (56e). Interestingly, conjoining *and ship C also carried GM soybeans* to *Every ship carried flip flops,* as in (56c), does not make for a better answer. Such an answer would be, in fact, inappropriate. It is overinformative. In Gricean terms, it is uncooperative. This is because (56b) responds not to a question about events, but to a question about individuals (*viz., what x is such that it was carried by every ship?*). Our universe contains one relevant individual. A complete answer names it. Adding *and ship C also carried GM soybeans* here is no more germane than adding, *and at a water temperature of 52 degrees you really want a 6 mm wetsuit.* The PL answer, on the other

---

31 Other answers that were not volunteered include “The third- and the second-floor tenants planted annuals,” and “The third- and the second-floor tenants planted marigolds and pansies (respectively).”
hand, is a question about events in which A, B, and C are the agents. Our universe includes four relevant events. A complete answer identifies all four.32

**Technicalities**

We said in Chapter II that we would follow Parsons (1990), in taking verbs as predicates of events (or states). We assume verbs have an implicit event argument and that the participants in an event are related to the verb by secondary predicates, as in (60).

60. a. Buffy stabbed the vampire with a stake.
   
c. $\exists e [\text{STAB}(e) \land \text{AGENT}(e) = a \land \text{THEME}(e) = v]$

32 Bernhard Schwarz (p.c.) points out that if the PL reading corresponds to the event reading, as we claim, it should be unavailable with non-eventive predicates. He points to the example in (i).

(i) What languages does each of these students know?

*Know* is an individual-level predicate. We would not therefore expect it to have an event reading. (Knowing is a state: nothing occurs when one knows something. *Know*, like other stative verbs, is infelicitous in the progressive, as the dialogue in (ii) shows.

(ii) A: I know that $\pi$ is a mathematical constant which represents the ratio of the circumference of a circle to its diameter, which is equivalent to the ratio of the area of the circle to the square of its radius; $\pi$ is an irrational and transcendental number approximately equal to 3.14159.

   B: #How long have you been knowing that?

Now, given that *know* is non-eventive, we would not expect (i) to have a PLR. Yet it does. (i) readily admits answers of the form of *A knows Aramaic and Abenaki, B knows Bathari, C knows Chinook Wawa.*

We believe that the PLR in (i) is forced by the use of the necessarily distributive *each*. If we replace *each* with *every*, the individual reading is strongly preferred. Thus (iii) solicits answers of the form of *Every student knows Spanish.*

(iii) What language does every student know?

We discuss this point a bit further in footnote 40. Like Schwarz, we wanted to test the hypothesis that PLRs would be unavailable with predicates that do not introduce event arguments. According to Kratzer (1996), statives do not introduce event arguments. This prediction is born out. Compare iv (a) and (b). (b), with the stative *be aware of*, does not seem to lend itself to a PLR anywhere near as easily as does (a), with the active *see*.

(iv) a. What did the three girls see?
   b. What were the three girls aware of?
   c. #Marie-Soleil was aware of the danger of the situation, Marie-Douce was aware of the strange tension between Marie-Soleil and Marie-Claire, and Marie-Claire was aware of the fact that time was running out.
Below, we suggest, first, an algebraic semantics for PLRs and, second, a dynamic semantics. In Step (5) of our first derivation, we will stray a bit from the Neo-Davidsonian fold. We will follow Kratzer in assuming a certain asymmetry between the internal and external arguments of a verb. Only the latter is introduced with an event role predicate like AGENT or THEME. In the second of our derivations we return to the Neo-Davidsonian fold, assuming that both internal and external arguments are introduced with event role predicates. In both cases, however, the intuition that guides our proposals is the same. (61), for example, is analyzed in both cases in a manner that could be paraphrased as in (62a).

61. What did the two girls see?
62. a. Question: What (event is such that its theme) was seen by the two girls?
   b. Answer: (An event of seeing) a dolphin.33

An event is uniquely associated with its participants. Imagine that Buffy stabs two vampires. We would represent this as two different stabbing events. Both have the same Agent, to be sure, and both may have happened at (more or less) the same time and place, but, having two different Patients, they are two different events. This means that specifying the individuals that fulfill the roles associated with an event will effectively identify the event. If PL answers appear to quantify over individuals that is precisely because there is a one-one relation between events and individuals.34

33 I simplify here and proceed as if quantification were over events simply and not event-individual pairs, which is what I will argue below. What I am trying to suggest is that What did she see? on its event reading, would correspond not to (i), its standard translation, but to something more like (ii).

   (i) \{that she saw a, that she saw b, that she saw c\}
   (ii) \{that there is an event of her seeing a, that there is an event of her seeing b, \ldots \}

In either case, resolving the question involves naming what was seen. The only difference is that in the second case this will, formally, pick out an event that is uniquely characterized by having that thing as its theme. Syntactically, no violence is done. Answers will be of the same type.

34 Manuel Español-Echevarría (p.c.) calls my attention to a curious agreement mismatch in Ancient Greek. Definite third person DPs may trigger singular third person agreement, as shown in (i).
Semantics
In the two sections immediately above we argued, first, that the subject in a PLR is referential and, second, that PLRs quantify over events. These two insights guide our proposals below.

Derivation One: Algebraic Semantics
Like Chierchia (1993, 1996), Hagstrom (1998) and others, we take the pair-list question to correspond to a set of questions. Thus, if a question corresponds, formally, to a set of propositions, a PL question will correspond, formally, to a set of sets of propositions. The question in (63a), then, would be represented as in (63b), which, in turn, corresponds to (63c), or, a little more formally, (63d). The formulae in (63d) “ask for” propositions of the form \( A/B/C \text{ saw } x \). Each of the component questions of (63d) abstracts over an individual variable. We can read these questions, \textit{Which thing is such that }A/B/C \text{ saw it?}

63. a. What did the three girls see?
   b. \{\textit{What did Alisha see?}, \textit{What did Beatrice see?}, \textit{What did Carmen see?}\}
   c. \{\{Alisha saw a dolphin, Alisha saw a leopard shark, Alisha saw a sea lion, . . . \},
      \{Beatrice saw a dolphin, B. saw a leopard shark, B. saw a sea lion, . . . \},
      \{Carmen saw a dolphin, C. saw a leopard shark, C. saw a sea lion, . . . \}\}
   d. \{\(\lambda p \exists x. p = \lambda w. (Alisha \text{ saw } x)(w)\),
      \(\lambda p \exists x. p = \lambda w. (Beatrice \text{ saw } x)(w)\),
      \(\lambda p \exists x. p = \lambda w. (Carmen \text{ saw } x)(w)\}\}

We have argued that PLRs involve quantification over an event variable. This would mean that the PL question doesn’t abstract (just) over an individual but over a (pair of an individual and) an event, somewhat as in (64). The logical structure of the PL questions is something like \textit{Which seeing event has one of the three girls as its agent?} Answers identify

(i) Ta paidia pezei.
    the.NOM.NEUT.SG child.NOM.NEUT.SG play.3RD.SG
    “The children play.”

This agreement mismatch is not attested with quantified DPs in subject position.
events by naming their themes: (The event of seeing) a dolphin, (The event of seeing) a sea lion, . . . .

64. \{\lambda p \exists e \exists x, p = \lambda w. (*\text{SEE} (e, x) \wedge *\text{AGENT} (e) = a)(w),
\lambda p \exists e \exists x, p = \lambda w. (*\text{SEE} (e, x) \wedge *\text{AGENT} (e) = b)(w),
\lambda p \exists e \exists x, p = \lambda w. (*\text{SEE} (e, x) \wedge *\text{AGENT} (e) = c)(w)\}

(64) may be notated a little more economically, as in (64'). P is a variable over sets of questions, type \text{<<<s,s,t,t>>>.} ATOM is usually understood as asserting the atomicity of its argument. In what follows, I idiosyncratically define ATOM is a kind of a choice function applying to (possibly plural) elements of type \text{<d>.}^{35}

64'. \lambda P. P(\lambda p \exists e \exists x & p = \lambda w (*\text{SEE} (e, x) \wedge *\text{AGENT} (e) = \text{ATOM} (\text{the\_three\_girls})))(w)

Below, we attempt to derive (64').^{36} We adopt the conventions for semantic interpretation in Heim and Kratzer (1998). We take logical representations to be expressions of an intensional typed \lambda-calculus with the basic types \text{t} (propositions), \text{d} (entities), \text{v} (states, events), \text{s} (worlds). Variables from the end of the alphabet \(x, y, z\) range over singular and

---

35 Bernhard Schwartz (p.c) points out that, if we understand ATOM not as a choice function but, as is more common, as asserting the atomicity of its argument, (64) would be translated as in (i):

\[(i) \quad \lambda P. \exists y [\text{ATOM} (y) & y \leq a + b + c & P = \lambda p \exists x [p = \lambda w. \ldots ]\]

We argue, however, that the \text{the\_three\_girls} is referential. There is no need, therefore, to assert the existence of the unit. One doesn’t assert the existence of a referential element. That would be like \exists x. \text{John}(x). Nor is there any need to engineer its WS – being referential, it simply has WS. ATOM, as I define it, applies only to atoms. If the \text{the\_three\_girls} is not atomic, type-mismatch ensues, and ATOM simply won’t do its work.

36 We take PL questions to be families of questions and and we employ a Hamblin-style alternative semantics to derive such families of questions. Bernhard Schwarz (p.c) points out that our event semantics is added as an additional seemingly unrelated component. Moreover, Schwarz points out, the derivation need not make use of event semantics. Families of questions need not ask for events: an alternative would be to assume existential closure of the event variable within the scope of \text{P =}. We do not mean to imply at a family of questions can only be generated with an event semantics, only that it is possible to do so.
plural individuals, construed as mereological sums; $e, e', e''$ range over singular and plural eventualities, also construed as mereological sums.

Further types: if $\sigma$ is a type and $\tau$ is a type, $<\sigma, \tau>$ is type, a function from the domain of $\sigma$ to the domain of $\tau$. A predicate is type $<d, t>$ – it maps individuals to truth values. A proposition is represented as a set of possibilities (“possible worlds”) in which the proposition is true. The semantic type of a proposition is $<s, t>$ (the characteristic function\(^{37}\) of a set of possible worlds). We omit punctuation where this does not lead to confusion, so $<d, t>$ is written $<dt>$, and $<s, t>$ is written as $<st>$, and so on.

Further variables: $V$ is a variable over sets of predicates of events (i.e. over VPs), type $<<vt>t>$. $R$ is a variable over sets of functions from individuals to predicates of events (i.e. over unsaturated VPs), type $<<d, vt>t>$. $P$ is a variable over sets of questions, type $<<s, st>t>$.

We assume that semantic interpretation is compositionally derived from the structure provided by the syntax.\(^{38}\) The primary mechanism for combining (semantically contentful) elements is functional application. (65) provides a definition of functional application; (66) provides an example.

65. Functional application

If $\gamma$ is a syntactic node with daughters $\alpha$ and $\beta$, for all assignments $g$ and worlds $w$

$$[[\gamma]]^{g, w} = [[\alpha]]^{g, w} ([[\beta]]^{g, w}) \text{ or } [[\beta]]^{g, w} ([[\alpha]]^{g, w}),$$

\(^{37}\) A set $A$ containing elements of type $\alpha$ can be described in terms of a function from the domain of type-$\alpha$ elements (D$\alpha$) to the domain of truth values ($\{0, 1\}$), where the characteristic function of the set $A$ assigns 1 (“true”) to any $a$ of type $\alpha$ such that $a \in A$ and 0 (“false”) to any other $a$. The characteristic function embodies the membership information of the set $A$. Because the information carried by the set $A$ and the characteristic function of $A$ are equivalent, it does no harm to speak of sets and characteristic functions interchangeably.

\(^{38}\) The principle of compositionality is a theoretical primitive of formal semantics. As Maria Bittner explains, “The principle of compositionality is so far the only candidate we have for a general solution to a basic empirical problem – how the speakers of a language can determine the truth conditions for an infinite number of sentences . . . in spite of the finite storage and computational capacity of the human brain,” (Bittner 1995).
which ever is defined.

66. a. [IP[DpMary] [vpsmiled]]
   b. [[Mary]] = mary
   c. [[smiled]] = λx[SMILE (x)]
   d. λx[ SMILE (x)](Mary) = SMILE (Mary)

In (66) Mary and smiled are (treated as) sisters. [[.]] gives the denotation (semantic value) of linguistic expressions. The semantic value of smiled is a function which takes an individual argument and returns 1 (“true”) if the individual smiled. Other conventions will be introduced at those points in the derivation where they become relevant.

(67a) represents the syntax we assume for What did the three girls see? (67b) gives the semantic types of the elements at each node in the tree. In (68) we assign a meaning to each node in the tree. In steps (14) – (18) we let “A” stand for the function ATOM, and “t_t_g” for the individual the_three_girls.
The diagram illustrates the syntactic structure of a sentence. The sentence begins with a CP (Complementizer Phrase) which is followed by DP8, C', IP^2, 2, IP^1, DP^3, I', DP^2, XP, J^0, vP^2. The three girls is represented as ATOM, t_j, v', v, VP, AGENT, DP^1, V', t_i, V (comp), see.
b.
68.
1. \( V^0 \) \[\{\text{see}\} = \lambda x \lambda e v. \text{*SEE}(x,e)\] by definition
2. DP \[\{[[t]]\} = i\] by traces and pronouns
3. \( V' \) \[\{[[1]](\{[[2]]\}) = \lambda e v. \text{*SEE}(i,e)\] by functional application
4. VP \[\{[[3]]\} = \{[[3]]\}\] by traces and pronouns
5. \( V' \) \[\{[[5]](\{[[4]]\}) = \lambda x \lambda e v. \text{AGENT}(e) = x \land \text{*SEE}'(i,e)\] by event identification
6. \( \text{spec, } V' \) \[\{[[t]]\} = j\] by traces and pronouns
7. \( V_P \) \[\{[[6]](\{[[7]]\}) = \lambda x \lambda e v. \text{AGENT}(e) = j \land \text{*SEE}(i,e)\] by functional application
8. \( \text{spec, } V' \) \[\{[[5]](\{[[4]]\}) = \lambda x \lambda e v. \text{AGENT}(e) = x \land \text{*SEE}'(i,e)\] by event identification
9. \( \text{spec, } V' \) \[\{[[t]]\} = j\] by traces and pronouns
10. \( \text{spec, } V' \) \[\{[[5]](\{[[4]]\}) = \lambda x \lambda e v. \text{AGENT}(e) = x \land \text{*SEE}'(i,e)\] by event identification
11. \( \text{spec, } V' \) \[\{[[t]]\} = j\] by traces and pronouns
12. \( \text{spec, } V' \) \[\{[[5]](\{[[4]]\}) = \lambda x \lambda e v. \text{AGENT}(e) = x \land \text{*SEE}'(i,e)\] by event identification
13. \( \text{spec, } V' \) \[\{[[t]]\} = j\] by traces and pronouns
14. \( \text{spec, } V' \) \[\{[[5]](\{[[4]]\}) = \lambda x \lambda e v. \text{AGENT}(e) = x \land \text{*SEE}'(i,e)\] by event identification
15. \( \text{spec, } V' \) \[\{[[t]]\} = j\] by traces and pronouns
16. CP \[\{[[15]]\} = \lambda p. \exists x \exists e v. \land p = \lambda w. \text{AGENT}(e) = x \land \text{*SEE}(x,e)\] by pointwise functional application
17. \( \text{spec, } V' \) \[\{[[t]]\} = j\] by traces and pronouns
18. \( \text{spec, } V' \) \[\{[[5]](\{[[4]]\}) = \lambda x \lambda e v. \text{AGENT}(e) = x \land \text{*SEE}'(i,e)\] by event identification
19. \( \text{spec, } V' \) \[\{[[t]]\} = j\] by traces and pronouns
20. \( \text{spec, } V' \) \[\{[[5]](\{[[4]]\}) = \lambda x \lambda e v. \text{AGENT}(e) = x \land \text{*SEE}'(i,e)\] by event identification
21. \( \text{spec, } V' \) \[\{[[t]]\} = j\] by traces and pronouns
QED
Let’s walk through this.

**Step 1.** \( V^0 \) \([\text{see}] = \lambda x \lambda d. e_v. \ast \text{SEE} (x,e)\)

*see* is defined as a two-place predicate taking an event argument and a theme argument. We understand “theme” as a generic name for an internal argument.

**Step 2.** \( DP \) \([\text{[t]}] = i\)

We assume that *what* has raised. Consistent with a Minimalist version of Chomsky’s Principles and Parameters approach to syntax, we assume that *what* raises to check a strong [+Q] feature on \( C^0 \). In doing so, it leaves a bound variable in its base position.

Syntactically, a bound variable is a trace. The interpretation of pronouns and traces is simply the value that the assignment function\(^{39}\) assigns to them. (69) gives the rule for the interpretation of traces and pronouns:

69. **Traces and pronouns rule**
   
   If \( \alpha \) is a pronoun or trace, \( a \) is a variable assignment, and \( i \in \text{dom}(a) \) then
   
   \([\alpha_i]^a = a(i)\)

**Step 3.** \( V' \) \([\text{see}][\text{[t]}] = \lambda e_v. \ast \text{SEE} (i,e)\)

What is crucial is that the trace is of type \(<d>\), the right type to combine with our predicate, *SEE*. This reduces the addicity of the predicate, making it a one-place predicate of events, type \(<vt>\).

**Step 4.** \( VP = [3] \)

As is standard, we assume that if no operation takes place the meaning of a node is simply “passed up” to the node immediately dominating it.

**Step 5.** \( v^0 \) \([\text{agent}] = \lambda x \lambda d. e_v. \text{AGENT} (e) = x\)

---

\(^{39}\) Variable assignments are defined as partial functions from the natural numbers to the domain of individuals.
Following Kratzer (1994, 1996), Marantz (1997), Chomsky (1998), Pylkkaanen (1999), Nakanishi (2004, 2006) and many others, we assume a certain asymmetry between internal and external arguments. While in classical Davidsonian and Neo-Davidsonian semantics, verb denotations include a place for the external argument, in Kratzer’s event semantics they do not. This is represented in (70).

70. Denotations for see

   a. Davidsonian -- $\lambda x\lambda y\lambda e. \text{SEE}(x,y,e)$
   b. Neo-Davidsonian -- $\lambda x\lambda y\lambda e. \text{SEE}(e) \land \text{AGENT}(e,x) \land \text{THEME}(e,y)$
   c. Kratzerian -- $\lambda x\lambda e. \text{SEE}(x,e)$

While internal arguments are true arguments of their verbs, external arguments are not. They are, rather, introduced by a functional head at some level above VP.\(^{40}\) We will assume that this occurs at the level of vP.\(^{41}\) The head that introduces the external argument is interpreted as the thematic relation that holds between the individual that is merged into its specifier position and the event described by its complement (Pilkkaanen 1999:164).\(^{42}\) In this case, that thematic relation is Agent, defined immediately above.

\(^{40}\) If statives do not introduce an event argument (Kratzer 1996) and, if, as we have argued, PLRs involve quantification over events, we would expect that PLRs will be harder to get with statives. This does indeed seem to be the case. Compare (a) and (b). (b), with the stative be aware of, does not seem to lend itself to a PLR anywhere near as easily as does (a), with the active see.

(i) a. What did the three girls see?
   b. What were the three girls aware of?
   c. #Marie-Soleil was aware of the danger of the situation, Marie-Douce was aware of the strange tension between Marie-Soleil and Marie-Claire, and Marie-Claire was aware of the fact that time was running out.

\(^{41}\) In doing so we don’t mean to exclude the possibility that this occurs in an independent functional projection, VoiceP, or something like that.

\(^{42}\) This allows us to account for basic distinctions in aspectual classification (aktionsart) (Kennedy 2007). Kennedy invites us to assume verbs have certain selectional restrictions on their event arguments, as in (i), and, further, that there are multiple voice heads, with different shades of meaning and possibly different selectional restrictions, as in (ii).

(i) a. $[[\text{own}]] = \lambda x\lambda e : \text{state}(e).\text{own}(x)(e)$
   b. $[[\text{walk}]] = \lambda e : \text{process}(e).\text{walk}(e)$
   c. $[[\text{build}]] = \lambda e : \text{event}(e) \land \text{protracted}(e).\text{build}(x)(e)$
Step 6.  $v' \left[\left[5]\right]\left[\left[4]\right]\right] = \lambda x_d \lambda e_v. \text{AGENT} (e) = x \land \ast \text{SEE} (i,e)$

AGENT combines with its sister by Event Identification. Event Identification is, essentially, a conjunction operation: it combines a function from individuals to predicates of events with a predicate of events. (71) gives the definition of EI.

71. Event Identification

If $\alpha$ is a constituent consisting of daughters $\beta, \gamma$ such that $[[\beta]]$ is type $<d<vt>>$ and $[[\gamma]]$ is type $<vt>$, then

$$[[\alpha]] = \lambda x \lambda e. [[\beta]](x)(e) \land [[\gamma]](e).$$

Step 7.  $<\text{Spec}, v'^1>$  $[[t_j]] = j$

*The three girls* raises. We assume, again consistent with a Minimalist version of a Principles and Parameters syntax, that *the three girls* raises to check nominative case features (or an EPP feature). This movement leaves a trace, $t_j$, type $<d>$.  

Step 8.  $\nu P^1 \left[\left[6\right]\right]\left[\left[7\right]\right] = \lambda e_v. \text{AGENT} (e) = j \land \ast \text{SEE} (i,e)$

Functional application applies unproblematically to combine $[[6]]$ and $[[7]]$. $j$ saturates one argument in the function in (6). The result is a predicate of events.

Step 9.  $\nu P^2 \quad \lambda x_d \lambda e_v. \text{AGENT} (e) = x \land \ast \text{SEE} (x,e)$

A moved constituent forms a chain with its trace. This is usually indicated by coindexation. In the system proposed in H&K the raised constituent c-commands an index. This index has its own node in the tree. The index triggers $\lambda$-abstraction. Another way of

---

d. $[[\text{notice}]] = \lambda x \lambda e : \text{event}(e) \land \text{happening}(e). \text{notice}(x)(e)$

(ii) a. $[[\text{v-active}]] = \lambda x \lambda e : \text{event}(e). \text{agent}(x)(e)$
   b. $[[\text{v-state}]] = \lambda x \lambda e : \text{state}(e). \text{holder}(x)(e)$

This precludes the combination of a state-verb like *own* and $[[\text{v-active}]]$. As (iii) shows, the result of such a combination would be semantically anomalous.

(iii) $\lambda x \lambda e : \text{event}(e). \text{agent}(x)(e) \land [\lambda e' : \text{state}(e'). \text{own}(\text{the car})(e')]$
saying this is that the meaning of the index is the instruction to abstract over its scope. (1) gives the rule for predicate abstraction.

72. **Predicate abstraction:**

If $\alpha$ is a branching node with daughters $\beta$ and $\gamma$ and $\beta$ dominates only a numerical index $i$, then for any variable assignment $a$

\[
[[\alpha]]^a = \lambda x.([[\gamma]]^a_{x/i})
\]

$a_{x/i}$ is exactly like $a$ except that $i$ is mapped to $x$.

In the example under consideration, as a result of predicate abstraction $i$, which had supplied an argument for SEE is replaced by the variable $x$, which, unlike $i$, is available for binding.

**Step 10.** $I' = [[9]]$

As in (Step 4), when no operation takes place, the meaning of a node is simply passed up to the node immediately dominating it.

**Step 11.** $DP^2 \ [\text{the three girls}] = \text{the\_three\_girls}$

We have argued at length in section 2 that *the three girls* is referential. This means that *the three girls* does not introduce a variable. It is, rather, entered just as a proper name would be.

**Step 12.** $XP \ [\text{atom}] = \lambda x_3. x' \leq x$

---

43 There is considerable debate about the proper treatment of proper names. Montague (1973) argued that they be treated as generalized quantifiers. We would represent *John* then, not as $j$ but as $\lambda P. P(j)$, taking the meaning of John to be the set of all the properties that are true of John. Substituting $\lambda P. P(j)$ for $j$ does not affect the truth conditions of the phrases that contain these expressions.

44 This means that the existence of the referent of *the three girls* is not asserted but figures among the presuppositions of the question. The dialogue in (i) would seem to indicate that this is indeed the case.

(i) Speaker 1. What did the three girls see?  
Speaker 2. “Three girls”? Molly saw a purple gula monster and Meaghan saw a green one. Was there a third girl?
ATOM functions to “break up” a complex atom and gather the atomic elements that compose it into an A(Iterative)-set. These elements thus become “visible” for the purposes of functional application. Essentially, ATOM creates a “Hamblin alternative set” in the sense of Kratzer and Shimoyama (2002).45

Step 13. DP³ [[12]][[[11]]] = \{x': x' ≤ \text{the\_three\_girls}\}^A

The application of ATOM to \text{the\_three\_girls} yields an A-set with three alternatives. I borrow my notation from Rooth’s semantics for focus46 and indicate this set with a superscript “A”. \{α': α' ≤ α\} designates the set of the atomic parts α’ of α; \{α': α' ≤ α\}^A designates the corresponding A-set. The former corresponds to a predicate, the latter to a complex individual.47

45 Building on Hamblin’s semantics for questions, K&S propose a “Hamblin semantics for indeterminate phrases.” K&S take all expressions to denote sets of ‘traditional’ denotations. While most lexical items denote singleton sets, indeterminates denote multi-member alternative sets. The composition of an alternative set and its sister involves “pointwise functional application.” K&S elaborate with reference to the example in (i).

\[(i) \quad [[\text{dare}\]]^\mathcal{W}_g = \{ x: \text{human}(x)(w) \} \]
\[[[\text{nemutta}\]]^\mathcal{W}_g = \{ \lambda x \lambda w'. \text{slept}(x)(w') \} \]
\[[[\text{dare nemutta}\]]^\mathcal{W}_g = \{ p: \exists x [\text{human}(x)(w) & p = \lambda w'. \text{slept}(x)(w')] \} \]

\text{Dare} (‘who’) denotes the set of all humans. The set contains as many alternatives as there are humans (relevant in the context). The verb \text{nemutta} (‘slept’) denotes a singleton set — the only alternative is the property of sleeping. Pointwise functional application applies, yielding the denotation of the sentence, \text{Dare(-ga) nemutta}, a set of propositions of the form ‘a slept’, ‘b slept’, ‘c slept’, etc.:

\[(p) \quad \text{Dare only planted TULIPS in the garden would include Mary only planted tulips in the garden and at least one other element with that is exactly like it except that the focused material is replaced by another constituent drawn from the same domain: Mary only planted irises in the garden, . . . Any two expressions with the same syntactic subconstituents will have the same ordinary meaning. So, MARY planted tulips and Mary planted TULIPS have the same ordinary semantic value. They will differ, however, in their alternatives. The focus semantic value of the first is a set of propositions of the form “x planted tulips”; the focus semantic value of the second is a set of propositions of the form "Mary planted x.” If we let [[α]] represent the regular meaning of an expression α, [[α]]^A is the set of its alternative meanings.

46 (Rooth, 1985, 1992, 1996) proposes an "Alternative Semantics" to account for the truth-conditional effect of focus. Focus, he suggests, triggers the construction of an "alternative set.” If we imagine the focused constituent replaced by a question word, the set of alternatives would be the Hamblin denotation of that question. Thus the alternative set of \text{Mary only planted TULIPS in the garden} would include \text{Mary only planted tulips in the garden} and at least one other element with that is exactly like it except that the focused material is replaced by another constituent drawn from the same domain: \text{Mary only planted irises in the garden, Mary only planted crocuses in the garden, . . . Any two expressions with the same syntactic subconstituents will have the same ordinary meaning. So, MARY planted tulips and Mary planted TULIPS have the same ordinary semantic value. They will differ, however, in their alternatives. The focus semantic value of the first is a set of propositions of the form “x planted tulips”; the focus semantic value of the second is a set of propositions of the form "Mary planted x.” If we let [[α]] represent the regular meaning of an expression α, [[α]]^A is the set of its alternative meanings.

47 Regine Ekhart has recently proposed that alternative sets be assigned a distinct type, <dτ>, where Dτ is \{0#, 1#\} (distinct from \{0, 1\} (Ekhart 2007). This paper was published after the work presented here was completed. The derivation presented here could be straight-forwardly reformulated using Ekhart’s type.
Step 14.  IP$^1$  [{[10]}][{[13]}]) = \{\lambda e_v. \text{AGENT}(e) = g_1 ^\land * \text{SEE}(i,e),
\lambda e_v. \text{AGENT}(e) = g_2 ^\land * \text{SEE}(i,e),
\lambda e_v. \text{AGENT}(e) = g_3 ^\land * \text{SEE}(i,e)\} = 
\lambda V_{<<vt>t>>}. V(\lambda e_v. \text{AGENT}(e) = A(t\text{ t g}) ^\land * \text{SEE}(i,e))

If the A-set in (11) were singleton, the derivation would proceed in the normal fashion.

The-three-girls c-commands the index. Composition would result in the substitution of
the_three_girls for $x$ in (10). Our A-set, however, contains three alternatives. Kratzer and
Shimoyama argue that the composition of an A-set with its sister may proceed “pointwise.”
(73) Gives K&S’s definition of pointwise functional application.

73. Hamblin Functional Application

If $\alpha$ is a branching node with daughters $\beta$ and $\gamma$, and $[[\beta]]^{w-g} \subseteq D_{\sigma}$ and
$[[\gamma]]^{w-g} \subseteq D_{<\tau>}$, then
$[[\alpha]]^{w-g} = \{a \in D_{\tau} : \exists b \exists c \ [b \in [[\beta]]^{w-g} \land c \in [[\gamma]]^{w-g} \land a = c(b)] \}$

If we “sound out” this definition we get something like: the composition of a $\beta$ type $<\sigma>$
and a $\gamma$ type $<\sigma \tau>$ yields a set of elements type $<\tau>$, each the result of the composition of
some element of $\beta$ with some element of $\gamma$.

In the example we are considering, then, we will have three instances of functional
application, composing, one by one, each member of our A-set with [[10]]. The result is an
alternative set of three unsaturated propositions of the form, roughly, $G$ is the agent in an
event of seeing $x$, where $G$ is one of our three girls.

Step 15.  IP$^2$  \{\lambda x_4. \lambda e_v. \text{AGENT}(e) = g_1 ^\land * \text{SEE}(x,e),
\lambda x_4. \lambda e_v. \text{AGENT}(e) = g_2 ^\land * \text{SEE}(x,e),
\lambda x_4. \lambda e_v. \text{AGENT}(e) = g_3 ^\land * \text{SEE}(x,e)\} = 
\lambda R.R(\lambda x_4. \lambda e_v. \text{AGENT}(e) = A(t\text{ t g}) ^\land * \text{SEE}(x,e))
There is, as far as we can see, no reason to assume $\lambda$-abstraction cannot be applied pointwise.\footnote{Hagstrom (1998) defines an operation he calls “flexible functional application.” FFA defines $\lambda$-abstraction for a set ($<\alpha>$) for any type $<\alpha>$), as in (i).} $\lambda$-abstraction over the set of propositions in (15) yields a set of unsaturated propositions, each of which requires an event and an individual.

There may, however, be a problem with this approach (Manuel Español-Echevarría, p.c. & Bernhard Schwartz, p.c.). Alternative sets work nicely to generate a “family of questions” reading. Unfortunately, they may also, not so nicely, generate a “family of declarations” reading. How, asks Schwartz, are we to block unattested readings? *The three girls saw me*, after all, is not equivalent to \{$\text{that a saw me, that b saw me, that c saw me}$\}. We respond that it is not the definite that triggers the generation of the alternative set. That is part of the semantics we have assigned to questions.

**Step 16.** $C^0$

$WHAT_j$ then takes each of these unsaturated propositions in turn as an argument and turns each into a set of propositions (type $<<s,st>t>$) derived by substituting in all possible values of $e$ and $x$.

**Step 16.** $C’$ $[[WHAT]]([[15]]) =$

\[
\{ \lambda_p.\exists x_d\exists e_v \land p=\lambda w.\text{AGENT}(e) = g^1 \land *\text{SEE}(x,e) \text{ in } w, \\
\lambda_p.\exists x_d\exists e_v \land p=\lambda w.\text{AGENT}(e) = g^2 \land *\text{SEE}(x,e) \text{ in } w, \\
\lambda_p.\exists x_d\exists e_v \land p=\lambda w.\text{AGENT}(e) = g^3 \land *\text{SEE}(x,e) \text{ in } w \} = \\
\lambda P_{<<s,st,t>>}.P(\lambda_p.\exists x_d\exists e_v \land p=\lambda w.\text{AGENT}(e) = A(t_\_g) \land *\text{SEE}(x,e) \text{ in } w)
\]

\footnote{Hagstrom (1998) defines an operation he calls “flexible functional application.” FFA defines $\lambda$-abstraction for a set ($<\alpha>$) for any type $<\alpha>$), as in (i).}

(i) **Flexible $\lambda$-abstraction**

\[
\lambda_1.\phi \overset{g}{\rightarrow} = \lambda A\exists \phi.A = [\lambda x.\phi \overset{g[-x]}{\rightarrow}] \land \forall x.\phi \overset{g[-x]}{\rightarrow} \in \phi \overset{g[-x]}{\rightarrow}
\]

where a) $\phi$ is a set, and b) the result is composable.
This approach requires no unduly complicated types, no extraordinary movement nor any operations that have not been shown to be independently necessary. It is, further, faithful to our intuitions, first, that the PLR corresponds to a set of questions, second, that these questions involve quantification over events, and third, that the subject DP is a complex individual. Is there any reason not to be satisfied? Perhaps only one. Ultimately, we said, we are conducting an inquiry in natural language metaphysics. Following a well-established tradition in formal semantics, we hypothesized that natural language quantifies over variables of (at least) two types, individual and event. We further hypothesized that while quantification in the nominal and verbal domains may not be over variables of the same type, the operations that these variables admit are the same. The null hypothesis must be that semantics has recourse to a minimal set of operations. Thus, having established that the calculation of the truth conditions of sentences with both d-and a-quantifiers requires tri-partite structure, we would like to find evidence to the effect that interrogative quantifiers, too, require tripartite structure for their interpretation. This is the primary task we have set ourselves in the second of our derivations, to which we now turn.

**Derivation Two: Dynamic Semantics**

In event-semantics, it is standard to introduce event role arguments conjunctively, as in (74b). The problem with doing things this way is that it cannot directly account for the dependence of one of the conjuncts on another.

74. a. The two girls saw Madonna.

   b. $\exists e: \text{SEE}(e) \land \text{AGENT}(e, \text{the_two_girls}) \land \text{THEME}(e, m)$

In any set of pairs $<a, b>$ where the value of $b$ varies with the value of $a$ we say $a$ is independent and $b$ is dependent. A PL answer to a question like *What did the two girls see?* can be thought of as a pair of pairs: $\{<\text{Alisha, a dolphin>},<\text{Beatrice, a leopard shark}>\}$. In this example *the two girls* would contribute the independent variable and *what* the dependent variable. Now, if, instead of assigning (75a) a flat (simplex) structure as in (75b), we assign it a tripartite structure, as in (75c), this covariation can be accounted for.

As far as we can see, pointwise $\lambda$-abstraction is just a special case of pointwise functional application.
75. a. Who did the two girls see?
   b. \(?e: \text{SEE}(e) \land \text{AGENT}(e, \text{ATOM}'(\text{the_two_girls})) \land \text{THEME}(e,x)\)
   c. \(?e [\text{SEE}(e) \land \text{AGENT}(e, \text{ATOM}'(\text{the_two_girls}))][\text{THEME}(e,x)]\)

It has been standard since Chomsky (1977, 1978) to treat \(wh\)-expressions as restricted quantifiers. We propose that, semantically, the question operator, “?”, functions like an adverbial quantifier of the ilk of \(usually\) or \(always\):\(^{49}\) it operates on two expressions, the first restricts the domain of quantification, the second supplies the nuclear scope (Schwarzschild 1989, 1990; de Swart 1991).\(^{50,51}\) The questioned element in an interrogative sentence is uniformly mapped to the NS. PLRs result in all and only those cases in which the value of this element covaries with that of an element appearing in the restrictor. So, \(What\ did\ the\ two\ girls\ see?\) would be analyzed roughly as in (76). (“*” indicates (possible) plurality).

\(^{49}\) Lewis (1975) proposed that adverbs of quantification denote dyadic quantifiers that relate one set of conditions (containing one or more variables) to another set (which will share at least one variable with the first set). For example, (ia) would receive the analysis in (ib).

\[(i)\]
\[\begin{align*}
  a. & \quad \text{A quadratic equation usually has two different solutions.} \\
  b. & \quad \text{Usually}_x (\text{quadratic equation}(x))(\text{has two different solutions}(x))
\end{align*}\]

\(^{50}\) de Swart develops a temporal version of Generalized Quantifier Theory. She takes Q-adverbs to express relations of two sets of eventualities or situations. The first argument always contains an existentially quantified variable as a place holder for the part of the sentence that is in focus. The variable may be of any type – an object, a sort, a place, a relation.

\(Always\), for example, like \(all\), expresses the subset relation, as in (i), which gives de Swart’s analysis of \(Jane\ always\ knits\ NORWEGIAN\ SWEATERS.\)

\[(i)\]
\[\begin{align*}
  \text{ALWAYS}((\exists y (\text{JEANNE\ KNIT}\ y), (\text{JEANE KNIT NORWEGIAN SWEATERS}))
    \{e | \exists y (\text{JEANNE KNIT}\ y)(e)\} \subseteq \\
    \{e | \text{JEANNE KNIT NORWEGIAN SWEATERS}(e)\}
\end{align*}\]

\(^{51}\) There is some question as to the status of tripartite structures. In particular, there seems to be no agreement as to whether they are syntactically represented. Heim (1982: ch 2) proposes that they are present at the level of logical form. This would mean that they are a part of the input of semantic interpretation. Partee (1995), on the other hand, argues that they should be viewed as an analytical tool at a metatheoretical level only (Menendez-Benito 2003: 141, n3).
76. \( ?e: \left[ R*\text{SEEING}(e) \land *\text{AGENT}(e, \text{ATOM}'(\text{the_two_girls})) \right] \)

\( \left[ N_S*\text{SEEING}(e) \land *\text{AGENT}(e, \text{ATOM}'(\text{the_two_girls})) \land *\text{THEME}(e, x) \right] \)

Above, we defined a function ATOM that can be thought of as a kind of an “inverse-choice function.” A CF is a function of type <dt, d>: it takes a non-empty set and returns a member of that set. (77) gives Reinhardt’s (1997) definition.

77. A function \( f \) is a choice function (CH(f)) if it applies to any non-empty set and yields a member of that set.

Reinhart invoked choice functions in order to explain the extraordinary scope of indefinites (see Chapter II, section 4). According to Reinhart, an indefinite determiner may introduce a choice function over the denotation of its CN sister. So, a in a girl will pick out one individual from some (contextually relevant) set of girls. Our ATOM, above, inverts this procedure. We defined it as a function of type <d, dt>, from a possibly complex individual to the A-set of its proper atomic parts.

Below, we redefine ATOM, suggesting that it be understood, basically, as an indefinite determiner, as a choice function. There are two differences, however, between a classical Reinhartian choice function and our ATOM’. First, while a choice function ranges over sets of individuals, type <dt>, ATOM’ ranges over possibly complex atomic individuals, type <d>. Second, while the cardinality of the range of a choice function ranges is restricted only by the context, in the case of ATOM’ it is restricted explicitly. So, a in a girl will pick out one individual from some (contextually relevant) set of girls of indeterminate cardinality, ATOM’ in ATOM’(the_two_girls)) will pick out one individual from a set of two (contextually relevant) girls. Thus, What did the two girls see? will be equivalent to What did a girl see? in a universe of two girls – it simply enjoins the questionee to exhaust the universe.

What evidence do we have for the structure in (76)? In cases in which the questioned element arguably appears in the restrictor and not in the nuclear scope, the PLR is lost.
This happens in the case of (78a), *Who did only the two girls see?* (78a) differs minimally from the example we have been discussing. It is hard to imagine what the PLR might be in this case, however. Certainly, (78b), *Only A saw B and only C saw D*, does not belong in the answer space. Where does the PLR we attested in *Who did the two girls see?* go? The interpretation of focus particle *only* requires that the utterance be structured as in (78c). The would-be dependent variable, THEME(e,x), appears in the restrictor. Covariation is, for this reason, not possible and the PLR is not available.

78. a. Who did only the two girls see?
   b. #Only A saw B and only C saw D.
   c. \(?e[R \forall x[\text{SEE}(e) \land \text{THEME}(e,x)]]
      \[\text{NS}(\exists y \land \text{AGENT}(e,y)) \rightarrow y = \text{ATOM}'(\text{the_two_girls})]\)

We proceed now with our derivation. Our language is that of predicate logic (PL), extended with a question operator, ?. The ordinary formulas of PL, \(\varphi\), are indicatives. If \(x^\rightarrow\) is a (possibly empty) string of variables, \(x_1, \ldots x_n\), of type \(<d>\) and \(e^\rightarrow\) is a (possibly empty) string of variables \(e_1, \ldots e_n\), of type \(<v>\) then \(?e^\rightarrow x^\rightarrow \varphi\) is an interrogative. The question operator queries the possible values of the variables under which the formula is true. In case \(e^\rightarrow x^\rightarrow\) is empty, \(?e^\rightarrow x^\rightarrow \varphi\) is a polar (yes-no) question.

We assume that semantic interpretation involves two related levels of representation, syntactic structure and logical form (lf), the latter constructed on the base of the former. If expressions are taken to determine the satisfaction conditions of the linguistic expressions they are associated with relative to a model \(M\), a context \(c\), and an assignment function \(g\). The model consists of a triplet, \(<W,D,I>\) where \(W\) is a set of possibilities, \(D\) a domain of sorted individuals, of types \(<d>\) and \(<v>\), and \(I\) a valuation function assigning intentions to constants in each possibility. \(g\) interprets free variables, assigning them values from \(D\). A function \(g'\) is said to extend a function \(g\) wrt a (pair of) set(s) of variables \(e^\rightarrow x^\rightarrow\) iff \(g'\) agrees with \(g\) on all assignments except for the variables to \(e^\rightarrow x^\rightarrow\). This is notated \(g'[e^\rightarrow x^\rightarrow]g\). In case \(e^\rightarrow x^\rightarrow\) is empty, \(g'\) is a trivial extension of \(g\). The function \(g\) is called the domain function for \(g'\), and \(e^\rightarrow x^\rightarrow\) is the extension set of \(g'\). We say that an expression \(z\)
is satisfied in \( w \) wrt \( M \) and \( c \) iff there is an assignment function \( g \) such that \( z \) is satisfied relative to \( g \) in \( w \) and \( c \), abbreviated \( (z)_{g,w,c} \).

With this much in place, the Hamblin denotation of a question could be represented as in (79a); the G&S denotation as in (79b).

79. a. \( [[?x \neg \varphi]]_{M,c,g} = \{ w' \mid [(\varphi)]_{M,w',g'(x \rightarrow)} = 1 \mid g'(x) \in D* \} \)

   b. \( [(?x \neg \varphi)]_{M,c,g} = \{ w' \mid \forall g'[x \rightarrow]g': [(\varphi)]_{M,w',g'(x \rightarrow)} = [(\varphi)]_{M,w,g'} \mid w \in W \} \)

In both cases, the meaning of a question corresponds to a set of propositions (its possible answers). In (79b), however, the question also defines a partition.

(80) gives our definition of a question that would be part of the question set in a PLR.

80. \( [[?e \neg x \varphi]]_{M,c,g} = \{ w' \mid \forall g [e \rightarrow]g \land \forall g'[x \rightarrow]g': [(R)]_{M,w',g} = 1 \rightarrow [(NS)]_{M,w,g'} = 1 \mid g'(e \rightarrow) \in D* \land g'(x) \in D* \} \)

where \( R \) stands for restrictor and \( NS \) for nuclear scope.

We assume that the whole of the question minus the questioned element maps to the restrictor, while the whole of the question, including the questioned element, maps to the nuclear scope. In the case of \( \text{What did the three girls see?} \) this mapping operation would produce (81).

81. \([R \exists e.\text{SEE}(e) \land \text{AGENT}(e, \text{ATOM'}(\text{the_three_girls}))]\)

\[ [\text{NS} \exists e. \text{SEE}(e) \land \text{AGENT}(e, \text{ATOM'}(\text{the_three_girls}) \land \text{THEME}(e, x))] \]

\( ([R]_{M,w,g} = 1) \) will give us a set \( G' \) of functions \( g' \) that assign values to \( e \) such that the expression in \( R -- \exists e.\text{SEE}(e) \land \text{AGENT}(e, \text{ATOM'}(\text{the_three_girls}) \) -- is true.

\( ([\text{NS}]_{M,w,g'} = 1) \) will give us a set \( G'' \), of functions \( g'' \), each of which extends a function in \( G' \) assigning a value to \( x \) that makes the expression in the NS -- \( \exists e. \text{SEE}(e) \land \text{AGENT}(e, \text{ATOM'}(\text{the_three_girls}) \land \text{THEME}(e, x)) \) -- true. So, (81) is going to group all those worlds
such that if \( g' \) assigns some value to \( e \) in \( w' \) which makes \( R \) true, then \( g'' \), an extension of \( g' \), assigns some value to \( x \) that makes \( NS \) true.

As in our algebraic semantics, we understand a PLR as a set of questions. So, ultimately we have not (80), but something more like \( \lambda P. P([([80])] \). The denotation we assign to a question \( Q \) maps a world \( w' \) onto the complete and true answer to \( Q \) in \( w' \). Thus, in some sense, at the end of the day, it doesn’t do anything that Hamblin’s denotation doesn’t do. Is there any value to the added complications, then?

First, doing things this way accounts for the “functional feeling” of PLRs by making the values of \( x \) depend on the values of \( e \). The functions in \( G'' \) are dependent on the functions in \( G' \) in that they are defined by associating to every \( g' \) in \( G' \) a function \( g'' \). This allows us to account for the covariation that is characteristic of PLRs.

Second, doing things this way allows us to “regularize” the semantics of interrogative sentences, making it resemble a little more closely the semantics of quantified declarative sentences.

**Explaining PLR quirks**

We said that the principal empirical puzzle with respect to PLRs has to do with their distribution. Auxiliary empirical puzzles include: (1) why quantifiers that do not generally generate PLRs may do so when they are D-linked (2) why the PL answer is exhaustive and (3) why, the subject-object asymmetry attested in the case of universal quantifiers disappears with definites. We address the distributional puzzle in section 6.1; the auxiliary puzzles receive our attention in sections 6.2-6.4.

**Distribution**

**The general case**

In a PLR each atom of the plural individual is associated with one event in a plural event. This explains the distributional facts: genuinely quantitative QDPs, like *most girls* in (81b), not being atomic, may not fill event roles like agent or patient.
81. a. What did the three girls see?
   b. What did most girls see? (*PLR)

We argue that, in the case of questions with quantificational DP subjects, while quantification over events is not possible, it may yet be possible to quantify over individuals. This makes a testable empirical prediction. The truth conditions of an answer to a question with a quantificational subject should be unambiguous: they should be those of the statement’s individual (object)–related reading. No event reading should be available. Consider the scenario in (82).

82. Scenario: There are five cargo ships, A, B, C, D and E. A, B, C, and D made one voyage each. E made four. Their cargo was:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>plastic flip flops &amp; MP3 players</td>
</tr>
<tr>
<td>B</td>
<td>plastic flip flops &amp; MP3 players</td>
</tr>
<tr>
<td>C</td>
<td>plastic flip flops</td>
</tr>
<tr>
<td>D</td>
<td>plastic flip flops</td>
</tr>
<tr>
<td>E, voy. 1, 2, 3 &amp; 4:</td>
<td>coffee</td>
</tr>
</tbody>
</table>

In this scenario how do we judge What did few ships transport? If the question quantified over events, plastic flip flops and coffee would have the exact same status: both were the themes of four transporting events. The only possible answer would be MP3 players – Few ships transported MP3 players. This is not the way naive informants interpret this scenario, however. Few ships transported coffee is judged as true in this scenario. (In Chapter 5, Section 3.2, we report the results of our test of a similar example in French. In French, it seems, the judgments admit even less ambiguity). Our informants are not counting events.

Or consider the scenarios in (83).
83. a. There are five ships, A, B and C. A and B each made one passage through the lock. C made two. Their cargo was:

<table>
<thead>
<tr>
<th>Ship</th>
<th>Cargo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship A:</td>
<td>GM rice</td>
</tr>
<tr>
<td>Ship B:</td>
<td>plastic flip flops</td>
</tr>
<tr>
<td>Ship C, voyage 1:</td>
<td>plastic flip flops</td>
</tr>
<tr>
<td>Ship C, voyage 2:</td>
<td>MP3 players</td>
</tr>
</tbody>
</table>

Given the state of affairs in (83a), the question *What did most ships transport?* can be answered: *Plastic flip flops*. (83a) contrasts sharply with (83b) and (83c). In the context of the minimally different scenarios in (83b) and (83c), one is forced to deny the presupposition of the question – there is no thing such that most ships carried it. If quantification were over events, (83a) and (83b and c) would have the same answerhood conditions: *plastic flip flops* would be equally available as a response in all three situations. This is not the case: *What did most ships transport?* does not quantify over events.

83. b. There are four ships, A, B, C and D. Each made one passage through the lock. Their cargo was:

<table>
<thead>
<tr>
<th>Ship</th>
<th>Cargo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship A:</td>
<td>GM rice</td>
</tr>
<tr>
<td>Ship B:</td>
<td>plastic flip flops</td>
</tr>
<tr>
<td>Ship C:</td>
<td>plastic flip flops</td>
</tr>
<tr>
<td>Ship D:</td>
<td>MP3 players</td>
</tr>
</tbody>
</table>

c. There are three ships, A, B and C. A and B made one passage each through the lock. C made two. Their cargo was:

<table>
<thead>
<tr>
<th>Ship</th>
<th>Cargo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship A:</td>
<td>GM rice</td>
</tr>
<tr>
<td>Ship B:</td>
<td>MP3 Players</td>
</tr>
<tr>
<td>Ship C, voyage 1:</td>
<td>plastic flip flops</td>
</tr>
<tr>
<td>Ship C, voyage 2:</td>
<td>plastic flip flops</td>
</tr>
</tbody>
</table>
Universal quantifiers

Above, we allowed ourselves to make temporary abstraction of the universal quantifiers. Having established the foundations of the event analysis of PLRs, we are now in a position to account for PLRs with universal quantifiers.

Quantifiers, we argued, cannot figure as arguments in event role predicates. If the story we are telling is on the right track, questions like *What did every girl see?* should not solicit PL answers. Like *few girls* and *many geraniums*, *every girl* and *each geranium* are generalized quantifiers. Yet interrogatives with universal quantifiers do indeed have PLRs. While QPs with *few, many, less than 17, two-and-a-half times more than last week* and other quantifiers do not appear to lend themselves to PLRs, QPs headed by the universal quantifiers, *every* and *each*, do. Recall that Krifka (1992) argued that only *every* and *each* solicited genuinely distributive answers; according to Krifka, the “PLR” in examples like the ones we have been looking at is actually something else altogether -- an “overinformative” spell-out of the cumulative answer (cf. section 3). We have shown that this is not the case. There is no way to make a pre-theoretical distinction between PLRs and “PLRs.” What, then, are we supposed to make of the fact that, contrary to what our analysis might predict, questions with universals solicit PLRs? In previous analyses, the universals were taken as the norm and the analytical task was to explain the “exceptional” behavior of all the other quantifiers. We re-framed the inquiry: taking all the other quantifiers as the norm, we asked what makes the universals exceptional. The answer we suggest is that universals are “hybrids”: potentially referential quantifiers. Syntactically they sort with the quantifiers, in that, for example, they are subject to QR. Semantically, too, they sort with quantifiers, in that, for example, they are defined as predicates of sets or sets of sets (Portner 2005). That said, in extensional contexts, universals do what referential terms do – they pick out a unique set.52

---

52 We know that in the case of declaratives, the truth conditions of the individual and event readings are equivalent. Partee (1990a:10) writes: “There are at least two main kinds of quantificational ontology, quantification over individuals and quantification over cases, events or situations. These are often interchangeable from a purely truth-functional point of view (as in many examples with *every* and *always*).” The truth conditions, for example, of *Every girl who sees a goat pets it* and *A girl who sees a goat always pets it* are the same. Could we argue that, similarly, in the case of interrogatives, the answerhood conditions of the individual and event readings are the same? No, our argument until this point has taken for granted that this is not the case. Consider the scenario in (i).
Universal QPs function much like “descriptive” terms. Linguistic philosophers point out that “Socrates” (a name) and “the greatest philosopher in the Western tradition” (a description) have a common referent (Socrates). This, however, is contingently, not necessarily, the case. “Socrates” refers to Socrates in all worlds (it “rigidly designates” him in Kripke’s (1973) terms) while “the greatest philosopher in the Western tradition” might have referred to someone else. In fact, new information about our world might make us change our minds. What if we were to find out, for example, that Socrates is actually a fictional character, a kind of a “composite”? What if each dialogue recorded the conferences of different teachers over a period of two or three generations? What would we do then with the title, “The greatest philosopher in the Western tradition”? Would we assign it to someone else? Aristotle, maybe? Would “the greatest philosopher in the Western tradition” come to be used somewhat like “Prince” was after the artist formerly known as “Prince” changed his name to an unpronounced symbol?

In possible worlds semantics “Socrates” is said to refer to Socrates in all worlds, while the descriptive phrase “the greatest philosopher in the Western tradition” is said to refer to Socrates in the actual world, but not necessarily in all others. We want to argue that, much like descriptive terms, universal QPs refer contingently. Although they might pick out different individuals in different worlds, in any given world (or situation or event) they pick out a unique (plural) individual. That individual is the mereological sum of all the

---

i. Scenario: There are three cargo ships, A, B and C. A and B made one voyage each. C made two. Their cargo was:

- A: plastic flip flops
- B: plastic flip flops
- C, voyage 1: plastic flip flops
- C, voyage 2: coffee

In (i), although there is a good individual answer (“plastic flip flops”), there is not good event answer (there is no item that was carried on every voyage).

53 In Frege’s terms the two have the same reference but not the same sense. Frege made use of this distinction to explain the puzzle of why “The morning star is the evening star” is an informative statement, while “Venus is Venus” is a tautology. The morning star and the evening star have the same referent (the planet Venus), but not the same sense. The two designate the same thing differently.
individuals in the denotation of the common noun restriction on the quantifier. So, in a world/situation/event in which there are eight geraniums, *few geraniums* and *most geraniums* do not pick out unique sets. Different sets of three or fewer or five or more geraniums might “fit the bill.” In contrast, *every geranium* does indeed pick out a unique set. *Every geranium* in this situation designates a plural individual, a sum of eight geraniums. In a situation with sixteen geraniums, it would designate a plural individual made up of those sixteen geraniums.\(^{54}\) It is not necessary to make reference to witness sets.

**D-Linking**

Imagine this scenario. You and your five best girlfriends are a bit star-crazy. Between the five of you, you probably have at least 100 stars’ websites on your web-browser “favorites.” And you all always choose the longest lines at the supermarket just so you can read the tabloids. To celebrate your upcoming high school graduation, you all decided to take a trip to Hollywood together with the primary purpose of spotting stars. On the plane, each girl drew up a list, identifying the 12 stars she simply had to see. There was some overlap, of course, but, well, not everybody likes Angelina Jolie and Brad Pitt. After you get to the hotel, you call your mother. Your mother, of course, knows your five friends very well. After all, they have been hanging around the house ever since the seventh grade. She even helped you all plan the trip. Lent you her credit card and everything. She asks you (84a). You could very well answer (84b).

84. a. Who did *more than one girl* have on her list?

 b. Ah-lam and Briony had Jodi Foster; Corazon, Dolores and Francine had Madonna; .

This is an unexpected result: *more than one* is quantitative and should not give rise to a PLR. Where, as here, however, the quantifier is D-linked, a PLR may be exceptionally available.

\(^{54}\) Note that we do not here make use of witness sets, as Chierchia and G&S did (cf. section 2.4). It is not that the set has a unique witness, but rather, that, in any situation, it has a unique referent.
D-linked elements refer to specific members of a pre-established set. D-linking was a component of Rizzi’s (1990) Relativized Minimality account of Weak Islands. He distinguished between referential and non-referential \textit{wh}-Ps. Referential \textit{wh}-Ps were defined as those that bear a thematic role like Agent or Patient and are D-linked, while non-referential \textit{wh}-Ps are those that bear a role like Reason or Manner and are not D-linked. He argued that while referential \textit{wh}-Ps can be linked to their traces via referential indices, non-referential indices have to be linked to their traces via an antecedent-government chain. This chain can be broken by certain interveners. \textit{Wh}-Ps are A-bar specifiers. Intervenors for non-referential \textit{wh}-Ps then are other A-bar specifiers: \textit{not}, \textit{no one}, \textit{whether}, \textit{deny} and others. Although our analysis also turns on referentiality, it is not subject to the principal objection raised against RM, that \textit{whether} and \textit{deny} and others cannot plausibly be analyzed as A-bar specifiers.

From our perspective, the reason D-linking makes PLRs available in constellations that generally do not give rise to PLRs is that D-linking makes it possible to interpret a quantificational DP as a plural definite.\textsuperscript{55}

**Exhaustivity**

PLRs are “exhaustive.” Consider (85). The functional answer, \textit{Every girl invited her best friend}, does not preclude any girl from inviting someone else in addition. Even if, say, Jan also invited a girl she met last Thursday at the climbing gym, \textit{Every girl invited her best friend} remains a true and complete answer. In contrast, the PL answer in (85), \textit{Jayani invited Sam, and Sue invited Ashley}, is not a true and complete answer if Jan invited the girl from the climbing gym, too.

85. a. Who did every girl invite?
   b. Every girl invited her best friend.
   c. Jayani invited Sam and Sue invited Ashley.

\textsuperscript{55} Manuel Español-Echevarría (p.c.) points out that D-linking is normally thought of as a property of \textit{wh}-words, not quantifiers. We have claimed that a kind of type-shift occurs whereby a QDP comes to be interpreted as a plural definite. The claim that it is D-linking that accounts for this needs to be defended.
The issue of exhaustivity has most often been discussed with reference to examples like the one in (86) (cf. Heim 1994).

86. There are four ships. Three carried plastic flip flops and one carried nothing. Jane believes that the first three ships are the only ships to have passed through the lock. She knows that all three carried plastic flip flops.

Under these circumstances how are we to evaluate the claim in (87)?

87. Jane knows what the ships carried.

In the sets-of-propositions approach to constituent questions developed in Karttunen (1977), (87) would be judged true: Jane believes the conjunction of all the true answers to the question *What did the ships carry?* (Sharvit 2002:100).

According to G&S (1981, 1983), Karttunen’s question semantics is weakly exhaustive: it doesn’t account for the fact that when we know the answer to a question like *Who kite surfed?* we know of the people that kite surfed that they kite surfed and of the people that did not kite surf that they did not kite surf. Someone who knows who kite surfed should be able to divide the domain, identifying the kite surfers and the non-kite surfers. The Jane of our ship scenario would not group the fourth ship with the non-flip flop-carriers. (87), thus, would be judged false. In the semantics for questions developed in G&S, the basic denotation of a constituent question is not a function from worlds to sets of propositions, but from worlds to (simple) propositions. The result is a strongly exhaustive question semantics.

According to G&S, strong exhaustivity and *de dicto* interpretations go hand in hand (but see Beck and Rullmann 1999). Karttunen’s weakly exhaustive semantics, argue G&S, produces *de re* readings exclusively. Consider (88).

88. John knows which secret agents left.
Say Maya and Zoe are secret agents. John does not know that they are secret agents, but he does know that they left. Although John could indeed point to the secret agents who left, he could not answer the question *Which secret agents left?* On the *de re* interpretation, the sentence is true; on the *de dicto* interpretation, it is false.

Heim (1994) proposes a modification of Karttunen’s semantics. She defines two Answerhood operators, one strong (Exhaustive), one weak. Different verbs, she suggests, are lexically specified to take one or the other. *Know*, for example, is lexically specified to take the AnsExh of a complement question. *Surprise*, in contrast, selects AnsTrue. (Heim points out that when one is surprised who called one may actually be surprised who didn’t call – as when one expects Pat, Tracy and Chris to call but only Pat and Tracy do).

We would rather suggest that the exhaustive/*de dicto* and non-exhaustive/*de re* answers are in fact responses to two different questions, one asks about events, the other about individuals. From this perspective, in the scenario in (86), *Jane knows what the ships carried* is both true and false – it is true on its individual reading and false on its event reading.

If we are right -- if it is the case that exhaustive readings result from event quantification and non-exhaustive readings from individual quantification -- this kind of ambiguity should not obtain in cases in which the embedded question contains a genuine quantifier. Consider the scenario in (89).

89. Scenario: There are three cargo ships, A, B and C. A and B made one voyage each. C made three. Their cargo was:

- **A:** MP3 players
- **B:** plastic flip flops
- **C, voyages 1, 2 and 3:** coffee
90. a. Information state 1: C carried coffee three times.
    b. Information state 2: A carried MP3s, B carried plastic flip flops.
    c. Jane knows what most ships carried.

If Jane is in information state 1, (90c) is judged false: Jane does not in fact know what most ships carried. (90c) is judged true, however, if Jane is in information state 2. It is no use pointing out that in the first case Jane has information about more than half of the relevant transporting-events, while in the second, she doesn’t. *Most ships* is genuinely quantificational. This, we argued, means that event quantification is not available. (90c) is unambiguous.

The correlation between exhaustive answers and *de re* interpretations simply follows from the fact that, as we argued in section 3, answers that quantify over events are exhaustive and, as we argued in section 2, they are possible only with referential subjects.

**The subject-object asymmetry**

A further “auxiliary puzzle” is the so-called subject-object asymmetry. Recall from our discussion in Section 2.4.1 that, while sentences with quantified subject DPs can give rise to PLRs, the same quantifiers in object position do not give rise to PLRs. (91b), for example, is infelicitous as a response to (91a).

91. a. Who saw every boy?
    b. #Abe saw b1, Ben saw b2, Cam saw b3.

This asymmetry is not attested in the case of definites. (92a), with a “quantificational definite” object, readily admits a PL response.

92. a. Who saw the three girls?
    b. Abe saw g1, Ben saw g2, and Cam saw g3.

From our perspective this is not surprising. We argued that it is quantification over events that produces the PLR. Critically, the semantics we assigned to questions makes use of the
function ATOM. There is no reason to suppose that event quantification only occurs where
the subject is questioned. Nor is there any reason to suppose that ATOM can only be
applied to a quantificational definite subject. In the case of (92), something like (93) would
generate a PLR.

93. \(?e [\text{SEE}(e) \land \text{AGENT}(e,x)] \land \\
[\text{SEE}(e) \land \text{AGENT}(e,x) \land \text{THEME}(e, \text{ATOM'(the\_three\_girls)})]

In (91a) event quantification is impossible because the GQ every boy cannot figure as the
argument of the function ATOM. The question quantifies over individuals: Which \(x\) is such
that \(x\) saw every boy? No family of questions is generated. The exhaustive answer to the
question may name multiple individuals (“a, b, and c all saw every boy”), but the object is
not “severable” – a, b, and c must all have seen every boy for the answer to be true.

Summary of Chapter 3
We observed that the quantifiers that permit PLRs share two characteristics: they are
referential\(^{56}\) and complex -- \textit{sums} in the vocabulary of Link. We then pointed out that, like
quantified declaratives, quantified interrogatives permit both object- and event readings.
Crucially, the truth conditions of the answer to a PL question are those of the statement’s
event reading. This, we claimed, motivates the treatment of PLRs as quantifying over
events. We argued that individual, functional and PL answers result from quantification
over variables of different types: \(d\) (individual), \(f\) (functional) and \(v\) (event), respectively.
We then made two proposals for the semantics of PLRs, the first algebraic, the second
dynamic. In both proposals, the question operator was analyzed as an adverbial quantifier.
The whole of the question minus the questioned element maps to the restrictor; the whole
of the question including the questioned element maps to the nuclear scope. The
advantages of this approach are, first, that it accounts for covariation (the dependence of the
value of one variable on the value of another), and, second, that it contributes to the
unification (uniform treatment) of the semantics of the nominal and verbal domains.
Explanations of empirical phenomena associated with PLRs (the effect of D-linking, the

\(^{56}\) They pick out a unique set in any world/situation/event.
fact that PLRs are exhaustive, the (lack of) subject-object asymmetry) were shown to fall out.

We turn now to the analysis of Intervention Effects and Weak Islands.
Chapter 4. Intervention Effects

IEs: The data
The difference in grammaticality between (1) and (2) is attributed to Intervention Effects (IEs). It seems that grammatical questions may be rendered ungrammatical by the introduction of elements like only and not.

1. a. Did Peter invite Maria or Susanne?
   b. *Did only Peter invite Maria or Susanne?

2. a. Which diplomat should I discuss which issue with __?
   b. ??Which diplomat should I not discuss which issue with __?

In English, IEs are not very common. They do occur, however, in yes-no and alternative questions like (1) and in sentences, like (2), which otherwise permissibly violate superiority.\(^57\) They may also occur in sentences with Negative Polarity Items (Szabolcsi,\(^57\)

\(^57\) Theoretically, in a language like English in which only one wh-word raises, in sentences where both the subject and the object are questioned, either the subject or the object term might raise. Nevertheless, in general only the first option yields a grammatical utterance, as the contrast in (i) demonstrates.

(i) a. Who __ saw what?
   b. *What did who see __?

That said, it has been remarked that these Superiority effects do not survive if the monomorphemic what is replaced by which+N. Thus (iic) is perfectly fine. Add not, however, and the sentence is markedly degraded.

(ii) a. Who read what?
   b. *What did who read?
   c. Which book did which man read?
   d. ??Which book didn’t which man read?

According to Pesetsky (1987) at issue is whether the wh-word refers to a given set of entities in the utterance context, that is, whether it is D(iscourse)-linked. Which-Ps, it is argued, are inherently D-linked, while monomorphemic wh-expressions may be D-linked given appropriate contextual support, as in (iv).

(iii) I know what just about everyone was asked to do, but what did who (actually) do?
IEs are more common in French. In French, a question word may either be raised as in (3a) or left *in-situ*, as in (3b).

\[\text{According to Partee (2005), NPIs are items that are licensed only in “negative contexts.” For example, *any* and *yet* are NPIs in English, as the contrasts in (i) and (ii) show. In (i) *any* is perfectly acceptable after *I did not see*, but not after *I saw*; in (ii) *yet* is perfectly acceptable after *no one*, but not after *someone.*}

(i) I did not see any dead sea lions at Waddell.
   *I saw any dead sea lions at Waddell.

(ii) No one has moved the dead sea lions yet.
    *Someone moved the dead sea lions yet.

Other NPIs in English are *lift a finger*, *give a damn*, and *move a muscle*. So are *budge* and *a red cent*, as the contrasts in (iii) and (iv) show.

(iii) He didn’t budge.
     *He budged.

(iv) I don’t have a red cent.
     *I have a red cent.

Partee builds on Ladusaw’s ground-breaking work. According to Ladusaw (1979), the items that license NPIs have in common that they are all “monotone decreasing functions.” A function is monotone increasing if whenever \( a \leq b \), \( f(a) \leq f(b) \); a function is monotone decreasing if whenever \( a \leq b \), \( f(b) \leq f(a) \).

In the case of NPIs IEs do not affect the grammaticality of the sentence, but, rather, the availability of different scope configurations. (v) for example, is grammatical, but it cannot be interpreted to mean that it is not the case that at every party Mary wore the same earrings (i.e. it cannot be interpreted with the scope order Not>every>any).

(v) Mary didn’t wear any earrings to every party.

\[\text{In English questions words may be left in-situ, too, of course. In English, however, unlike in French this construction is marked. It is generally only felicitous in dialogues like (i), where Speaker B uses the question word to mark a place where communication has failed. “Echo questions” like the one in (i) usually involve focal stress on the question word. In French, in contrast, question-word-final questions are subject to no particular pragmatic constraint: they do not differ from question-word-initial questions in terms of their distribution.}

(i) Speaker A: My sister went to Bali with BLxxxx.
Speaker B: Your sister went to Bali with WHO?

In English, *wh*-in-situ is unmarked only in the event that the sentence has two or more *wh*-Ps, as in the example in (ii).

(ii) **When** did she go **where**?
3. a. **Qui ont-ils rencontré?**  
Who have-they met  
“Who did they meet?”

b. **Ils ont rencontré qui?**  
They have met who  
“Who did they meet?”

Crucially, in French, IEs only manifest themselves in in-situ questions, as the contrasts in (4) and (5) attest. In (4a) and (5a), *seulement* (“only”) and *pas* (“not”) are unproblematically introduced into the raised question; the introduction of the same elements into the in-situ variant in (4b) and (5b) is not possible.

4. a. **Qui est-ce que seulement Marie a vu?**  
Who is-it that only Marie has seen  
“Who did only Mary see?”

b. *Seulement Marie a vu qui?*  
only Marie has seen who  
“Who did only Mary see?”

5. a. **Qui n’ont-ils pas rencontré?**  
Who N have-they not met  
“Who didn’t they meet?”

b. *Ils n’ont pas rencontré qui?*  
They N have not met who  
“Who didn’t they meet?”

What will you tell who(m)?
Beck (2006) documents IEs in a wide variety of typologically unrelated languages including Dutch, English, French, German, Hindi, Japanese, Malayalam, Mandarin, Passamaquaddy, Thai and Turkish. She suggests that the phenomenon may well be universal. That said, the catalogue of interveners differs from language to language. According to Beck, the list of operators that may intervene in different languages includes:

6. only, even, also, not, (almost) every, no, most, few (and other nominal quantifiers), always, often, never (and other adverbial quantifiers).

The remainder of this chapter is organized as follows. In section 2, we offer a brief summary of Beck’s account of IEs. In section 3, we present data to support our hypothesis that IEs result where, for syntactic reasons, quantification over individuals is blocked. In section 4 we suggest one possible way to derive this result. Section 5 concludes.

**Extant accounts of IEs**

**Beck (2006)**

Beck’s account makes use of alternative semantics. She argues that IEs arise with the co-occurrence of two operators that make use of alternative sets. Following Hamblin (1958, 1973), she takes the denotation of a question to be the set of propositions that are its possible answers. Recall that, from this perspective the denotation of the question *Who planted irises?* will be a set of propositions of the form “x planted irises” – {that Mary planted irises, that Peter planted irises, that . . . }. (7c) gives the quasi-logical variant.

7. a. Who planted irises?
   b. {that x planted irises | x an individual}
   c. λp∃x [p=λw.x planted irises in w]

According to Rooth (1985, 1992) the interpretation of focus involves two semantic objects, the ordinary semantic value of the focused sentence (which is just the semantic value of its unfocused counterpart, a proposition) and its focus semantic value (a set of propositions, all
alternatives to the focused sentence). If we imagine the focused constituent replaced by a question word, the set of alternatives would be the Hamblin denotation of that question. The alternative set of *MARY planted irises in the garden* then would include *Mary planted irises in the garden* and at least one other element with that is exactly like it except that the focused material – *Mary* -- is replaced by another constituent drawn from the same domain: *Jayani planted irises in the garden, Aisha planted irises in the garden, . . .* The alternative set associated with *MARY planted irises in the garden* thus corresponds to the denotation of *Who planted irises in the garden?*, i.e. (7c).

If we take $\alpha$ to correspond to the value an expression would have if it weren’t focused (its ordinary semantic value) and $\beta$ to correspond to its alternative set, what only plausibly does is to assert that of all the members of $\beta$, $\alpha$ alone is true (in the actual world).

8. $[[\text{only}}](\alpha)(\beta)(w) = 1$
   \[ \text{iff for all } p \text{ such that } p(w) = 1 \text{ and } p \in \beta \beta=\alpha \]

While focus operators, like our representative *only*, make use of two semantic objects – the “ordinary” value of an expression absent focus and its focus (alternative, question) value - the question operator makes use of only one. Questions have no ordinary value.

Beck adopts Wold’s (1996) implementation of Rooth’s semantics of focus. The focus feature is indexed and functions as a distinguished variable. $g$ is an assignment function assigning values to individual variables; a second variable assignment $h$ assigns values to distinguished variables. Any two expressions with the same syntactic subconstituents will have the same ordinary semantic interpretation under $g$. So, *Mary$_{F1}$ planted tulips* and *Mary planted tulips$_{F2}$* have the same ordinary semantic interpretation – $g$ does not interpret focus variables. The two expressions differ, however, in their focus semantic interpretation. The first will correspond to a set of propositions of the form *that x planted tulips*, as in (9b) and the second to a set of propositions of the form *that Mary planted x*, as in (9c), where $h$ assigns values to $x$. The focus semantic value of an unfocused constituent is just its ordinary semantic value, as indicated in (9d).
9. a. \([\text{Mary}_F \text{ planted tulips}]^g = \lambda w. \text{Mary planted tulips in } w\]
   b. \([\text{Mary}_F \text{ planted tulips}]^{g,h} = \lambda w. \text{h}(1) \text{ planted tulips in } w\]
   c. \([\text{Mary planted tulips}_F]^g = \lambda w. \text{h}(2) \text{ in } w\]
   d. \([\text{Mary planted tulips}]^{g,h} = \lambda w. \text{Mary planted tulips in } w\]

We said that questions make no ordinary semantic contribution – their only function is to introduce alternatives. Thus if \(\alpha\) is a question, \([\alpha]^g\) will be undefined; \(\alpha\)’s focus semantic value will be its interpretation under \(h\), schematically, \([\alpha]^{g,h} = h(\alpha)\).

Beck’s system includes two focus-sensitive operators, a question operator and Rooth’s focus operator, \(\sim\). Both are taken to bind distinguished variables. \(\sim\) substitutes the ordinary interpretation of a phrase for its focus interpretation. Crucially, \(\sim\) is unselective – it binds any distinguished variable in its scope. Things go wrong where a focus operator has a question in its immediate scope, as the ordinary semantic interpretation of questions is undefined. This is what happens in the case of (10).

10. *Only JOHN saw who?

\[
[CP Q_2 [IP_3 \text{only}_C [IP_2 \sim C [IP_1 \text{John}_F \text{ saw who}_2]]]]
\]

With regard to the delimitation of the class of potential interveners, Beck predicts that it will include any element that can give rise to focus-affected readings. There need be no focused element in the sentence immediately in question. Thus, a sentence like (11) identifies every as an intervener: every child – and not every adult, say – jumped for joy. We assume, then, that every has \(\sim\) appended to its scope and can always potentially intervene. And, indeed, questions with every display IEs, as (12) shows.

11. Every CHILD jumped for joy.
12. *Which dog did every man introduce which cat to?
This analysis derives the ungrammaticality of the structure in (12).

13. *[Q_i [. . . intervener . . . [wh-P_i . . . ]]]

The explanation of our French facts within this system is straightforward. In Beck’s system, IEs result where the restrictor of the wh-expression remains within the scope of the intervener at LF. With French questions, this fatal configuration is produced with in-situ questions but not with raised questions. In the \textit{wh}-fronted question, unlike in the \textit{wh}-in-situ question, the question restrictor has raised and is no longer in the scope of the potential intervener. Rather, the Q-Op has its restrictor in its immediate scope and everything is hunky-dory.

**Problems**

Beck offers a powerful account. It is not, however, without a rather daunting empirical problem: it does not correctly identify the class of interveners. Not all potential interveners can be classed as focus operators.

\textit{Not}

\textit{Not}, for example, figures prominently on the list of potential interveners. Yet analyzing \textit{not} as a focus operator is not an uncontroversial move. It seems that negation is not felicitously analyzed as a focus particle of the ilk of \textit{only} or \textit{always}. Partee (1991), citing work by Hajićová (1984), writes that negation does not affect the truth conditions of focused sentences in the way that focus particles do. Rather, \textit{NOT} has an effect on a sentence’s presuppositions. In negated sentences, a proposition that is presupposed when it figures in the topic will be alleged when it figures in the focus. In (14a), for example, \textit{defeat} is unfocused: it belongs to the topic (background). We note that an existential presupposition attaches to it: a presupposition failure will result if \textit{our defeat} has no real-world referent. In contrast, in (14b) where \textit{defeat} is focused, there need not have been any defeat that Harry didn't cause for the sentence to be felicitous.

14. a. This time our defeat wasn't caused by HARRY.

   b. This time Harry didn't cause our DEFEAT.
Our own account of IEs makes reference to a different constellation. We argue that the constellation that leads to IEs is not, *pace* Beck, the co-occurrence of two operators that potentially make use of alternative sets but, rather, the co-occurrence of a quantifier and a *wh*-P that quantifies over individuals. If we are correct, a non-focusing quantificational element – like *quelqu’un* (someone) -- should compromise the grammaticality of French in-situ questions. The data bear out this prediction.

French, recall, permits both *qu*-(*wh*)-fronted and *in-situ* questions. Quantification is possible only in the former, however. For example, the *qu*-fronted variant of the French equivalent of *Who did most of the girls see?* is grammatical; the *qu*-in-situ variant is not, as (15) shows. Although *quelqu’un* (‘someone’) does not give rise to focus affected readings, sentences with *quelqu’un* do seem to manifest intervention effects, as the contrast between (16a) and (16b) shows. *Quelqu’un* is not unique: other quantificational elements, like *personne* (‘no one’) that do not give rise to focus-affected readings also manifest intervention effects, as (16c) shows.

15. a. *Qui* est-ce que la *plupart* des *filles* ont vu?
   Who is-it that the most of-the girls have seen
   “Who did most of the girls see?”

   b. *La* *plupart* des *filles* ont vu *qui*?
   The most of-the girls have seen who
   “Who did most of the girls see?”

16. a. *Les* *filles* ont vu *qui*?
   The girls have seen who
   “Who did the girls see?”

   b. *Quelqu’un* a vu *qui*?
   Someone has seen who
“Who did someone see?”

c. *Personne n’a vu qui?
   No one has seen who
   “Who did no one see?”

Quantification over individuals, quantification over events
In Chapter III we argued, first, that questions may quantify over events and, second, that event quantification is not possible with non-referential (quantificational) subjects. Event quantification makes use of event roles; these are defined for individuals (type $<$d$>$) only. Questions with non-referential subjects, when grammatical, quantify over individuals. IEs arise, we argue, where the subject is quantificational, but quantification over individuals is blocked, that is, IEs arise where quantification over individuals is “forced but impossible.”

The logic of the argument
It is standard to assume that overt movement blocks covert movement. This implies that $qui$ in (16b) remains in-situ at LF. It has been proposed that, in many cases, although covert movement may be blocked, feature movement may still possible. It is where feature movement, too, is blocked, that IEs result (cf. Pesetsky 2000). We, too, argue that IEs result where feature movement is blocked. While in Pesetsky’s account quantifiers are the “culprits” and in Beck’s it is focus operators, we argue that it is “WH-AGENT” that intervenes. $WH$-AGENT is the interrogative counterpart of $AGENT$, the head that introduces the external argument.

The data
This analysis makes two testable predictions. The first is not original to this thesis; the second, we believe, is. First, if IEs arise only where feature movement is blocked, and if it is overt movement that blocks covert (feature) movement, we would expect that in every instance in which we diagnose intervention effects, the “bad” IE sentence should have a “good” interpretable variant in which the $wh$-P raises overtly. Second, if in-situ questions

---

60 For now we simply assert this as an empirical observation. Below, we derive this result.
involve event quantification and raised questions involve individual quantification, we
would expect that in those instances in which wh-in-situ questions are acceptable, the only
available reading of the question will be its event reading and, in those instances in which
wh-in-situ is impossible (i.e. in questions whose in-situ variants show IEs), the only
available reading will be the individual reading. In the following two sections we present
evidence from French, Portuguese and Mandarin Chinese that shows that these predictions
are born out.

Overt and covert movement
We predict that instances of intervention effects form minimal pairs with sentences that
differ from them only in that the wh-phrase (or some part of it) raises.61

French
In the case of French this has already been established with regard to examples like (15),
repeated here as (17).

17. a. Qui est-ce que la plupart des filles ont vu?
   Who is-it that the most of-the girls have seen
   “Who did most of the girls see?”

61 In (1) we cited the received wisdom (cf. Pesetsky 2000) to the effect that English shows intervention
effects (only) in polar (yes-no) questions. The example we offered was (i).

(i) *Did only Peter invite Maria or Susanne?
(i) does not have an interpretable counterpart. This might, at first glance, seem to contradict our thesis.
We suggest, however, that it is not IEs that compromise (i). Consider (ii), the non-interrogative counter
part of (i).

(ii) Only Peter invited Maria or Susanne.
(ii) is already had. (i) makes just as much sense, and is just as acceptable, as (ii). The interrogative
variants of acceptable only-declaratives are acceptable, as (iii) and (iv) show.

(iii) a. Only Peter invited Maria and Susanne.
   b. Did only Peter invite Maria and Susanne?

(iv) Peter only invited either Maria or Susanne. (Best with focal stress on either)
    Did Peter only invite either Maria or Susanne?
b. *La _plupart_ des filles ont vu _qui_?
   The most of-the girls have seen who
   "Who did most of the girls see?"

_Portuguese_

The examples in (18)–(21) show that the Portuguese data patterns with the French data. Portuguese allows raised and in-situ questions, as (18) shows.⁶² As in French, in Portuguese IEs obtain only in the in-situ variant. (19) shows this result for determiner quantifiers, (20) for phrasal negation and (21) for adverbial negation. In (19) the introduction of _a maioria das/ao menos quatro/ poucas_ ("most/at least n, few") leads to IEs in the in-situ variant (b) but not the raised variant (a). While the raised and in-situ variants of "Who did they meet?" are equally acceptable, the introduction of _não_ ("not") is possible only in the raised variant (20a) and not in the in-situ variant (20b): **Quem é que eles não encontraram?** is fine; Eles _não encontraram quem_? is not. Similarly, as (21) shows, it is possible to introduce _nunca_ ("never") into the raised but not the in-situ variant of "Who did Peter see?": compare (a) (**Quem é que o Pierre (nunca) viu?**) and (b) (**Pierre (??nunca) viu quem?**).

18. a. **Quem é que eles encontraram?**
   Who is that they met
   "Who did they meet?"

   b. Eles encontraram **quem**?
   They met who
   "Who did they meet?"

19. a. **Quem é que a maioria das/ao menos quatro/ poucas garotas viram?**
   Who is that most/at least four/few girls saw
   "Who did most/at least four/few girls see?"

---

⁶² Thanks to Bruno Guedes Pereira at Universite Laval and Maria daLuz Tarver at San Jose State University for help with Portuguese examples.
20. a. **Quem** é que eles *não* encontraram?
   Who is that they *not* meet
   “Who didn’t they meet?”

   b. ??Eles *não* encontraram **quem**?
   They *not* meet who
   “Who didn’t they meet?”

21. a. **Quem** é que o Pierre *nunca* viu?
   Who is that Pierre *never* saw
   “Who has Pierre *never* seen?”

   b. ??Pierre *nunca* viu **quem**?
   Pierre *never* saw who
   “Who has Pierre *never* seen?”

Our informants reported that (18b, 19b, 20b and 21b) were not acceptable in neutral contexts. They were acceptable, however, in the same contexts in which question-word-final questions are acceptable in English. Consider a conversation between Asha and Beatrice:

Asha: Zoe got to see Rapha, but she didn’t see (mumble).
Beatrice: She didn’t see WHO?

Here, Beatrice is stressing the piece of information she missed. Beatrice’s sentence would be judged mal-formed as an out-of-the-blue question. For example, “Hey, Asha, Zoe didn’t see who at Burning Man?” is not “good English.” “She didn’t see WHO?”, however, is
fine in a context like the one above. The same type of context would licence an in-situ quantified question in Portuguese.

**Mandarin Chinese**

Whether or not an in-situ *wh*-phrase in Mandarin Chinese undergoes covert movement to its scope position is a matter of debate (Aoun & Li 1993). Tsai (1994) and Cole & Hermon (1999) (cited in Soh 2005) argue that *wh*-phrases fall into two groups, nominal and adverbial. In the first group are: *shenme* (‘what’), *shei* (‘who’), *na Numeral-Classifier N* (‘which N’) *nali* (‘where’) and *wei-li shenme* (‘purpose-why’). *weishenme* (reason-why) is in the second group. Tsai and C&H argue that only the latter raise to their scope positions at LF. Soh argues that both nominal and adverbial *wh*-raise covertly: the former undergo covert phrasal movement, the latter covert feature movement. She follows Pesetsky, assuming that intervention effects detect feature movement. She shows that *zhi* (‘only’), *bu* (‘not’) and other quantifiers are interveners in MC and that they block LF movement of *wh*-adverbs but not *wh*-nominals. What is relevant to us is simply that IEs obtain in MC only with *wh*-adverbs. In (22a) the *wh*-adverbial *weishenme* (‘reason why’) precedes *zhi/bu* (‘only/no’); (22b) is minimally different -- *zhi/bu* precedes *weishenme*. The former but not the latter is acceptable. *Wh*-nominals are unlike *wh*-adverbials in that in the case of *wh*-nominals, like *shenme* (‘what’), a quantifier may precede the *wh*-phrase without compromising grammaticality, as (24) shows.

22. a. Ni renwei Lisi **weishenme** {zhi/bu} kan zhentan-xiaoshuo?
   You think Lisi **why** only/not read detective novel
   ‘What is the reason x such that you think Lisi {only /does not} read(s) detective novels for that reason?’

   b. *Ni {zhi/bu} renwei Lisi **weishenme** kan zhentan-xiaoshuo?*
   You only/not think Lisi **why** read detective novels?
   ‘What is the reason x such that you {only/don’t} think Lisi reads detective novels for x?’

23. Ta {zhi/bu} mai **shenme**?
he only/not sell what?
‘What is the only thing x such that he {only/does not} sell(s) x?’

24. a. *{meiyounren/henshao ren/zuiduo liang-ge ren} weishenme cizhi?
   nobody/few people/at most two-CL persons   why resign?
   ‘Why did nobody/few people/at most two people resign?’

   b. {meiyounren/henshao ren/zuiduo liang-ge ren} gan gen shei dajia?
   nobody/few people/at most two-CL persons   dare with who fight
   ‘Who is the person x such that nobody/few people/ at most two people
dare(s) to fight with x?’

What is relevant to us now is simply an empirical observation: an interrogative that exhibits
IEs forms a minimal pair with an interrogative that differs from it only in terms of the
relative order of the quantifier and the question word.

**In-situ questions quantify over events, raised questions over individuals**
We will show that answers to in-situ questions are unambiguous: they have only an event-
related reading. We have assumed that overt movement blocks covert movement. We
pointed out that in-situ questions have counterparts in which the *wh*-phrase raises. We
concluded that the *wh*-phrase in in-situ questions -- in French, Portuguese and Chinese, at
least -- does not raise. Given our analysis, this should mean that this class of *wh*-in-situ
questions quantification will be over events. We presented our French and Portuguese
informants with two sets of examples to test this prediction.

*Relative “severability” of the subject DP in raised and in-situ questions*
Some of our informants reported that there is a presupposition that attaches to (25b) (the
raised variant) but not to (25a) (the in situ variant) to the effect that Jacques and Amélie
saw the same person/people (together). (25a), they report, may more readily be understood
as a conjoined question: *Who did Jacques see, and who did Amélie see?*63

63 The corresponding questions in Portuguese are Jean e Maria encontraram quem? And Quem
encontraram Jean e Maria?
25. a. Jacques et Amélie ont vu qui ?
   Jacques and Amélie have seen who
   “Who did Jacques and Amélie see?”

   b. Qui est-ce que Jacques et Amélie ont vu ?
   Who is-it that Jacques and Amélie have seen?
   “Who did Jacques and Amélie see?”

This is consistent with our analysis in Chapter III. If the in-situ question quantifies over events, the subject is taken to be a complex individual and the PL reading – the conjoined question reading – is immediately available.

**In-situ questions – data**

Second, we asked our French and Portuguese informants to consider the situation in (26).

26. **Situation:** There are three cargo ships, A, B and C. A and B made one voyage each. C made two. Their cargo was:

   - A: Oats.
   - B: Oats.
   - C, voy. 1: Oats.
   - C, voy. 2: Coffee.

In this situation, if quantification is over individuals, the answer is “oats.” What thing(s) $x$ is/are such that the three boats carried $x$? There is only one such thing: oats. If quantification is over events, however, the answer is “oats and coffee.” What thing(s) $x$ is/are such that they were carried in the three boats’ voyages? There are two such things: oats and coffee.

We asked our informants if, given the situation in (26), they judged the felicity of the responses in (27) differently depending on the form of the question. We predicted that
(28a), the individual answer, would be felicitous as a response to (27a), the raised question but not as a response to (27b), the in-situ question; we predicted that (28b), the event answer, would be felicitous as a response to (27b), the in-situ question, but not as a response to (28a), the raised question. These predictions were borne out: our informants generally “matched” the individual answer (“oats”) to the raised question and the event answer (“oats and coffee”) to the in-situ question.

26. a. Qu’est-ce que les trois bateaux portaient?
   O que é que os três barcos transportaram?
   What is(-it) that the boats transported
   “What did the boats carry?”

   b. Les trois bateaux portaient quoi?
   Os três barcos transportaram o quê?
   the boats transported what
   “What did the boats carry?”

27. a. Oats.
   b. Oats and coffee.

Raised questions – data
The question in (30) (“What did few boats transport?”) contains a quantifier. According to our analysis, this should preclude event quantification. If event quantification is not possible, only the individual reading of the question should be available. In the situation in (29), coffee sorts with salt on the individual reading (there are few boats that transported either salt or coffee); in contrast, coffee sorts with oats on the event reading (there were three events of oat-transport and an equal number of events of coffee-transport). We predicted that our informants would choose (31c), salt and coffee, as the best answer to (30). The results were largely in accord with our prediction.

28. Situation: There are three boats, A, B and C. A et B made one voyage each. C made three. Their cargo was:
29. a. **Qu’est-ce que** peu de bateaux ont transporté?
    **O que é que** poucos barcos transportaram?
    what is(-it) that few boats transported
    “What did few boats transport?”

    b. *Peu de bateaux ont transporté** quoi?  
    *Poucos barcos transportaram o** quê?  
    few boats transported what
    “What did few boats transport?”

31. a. Salt.  
    b. Coffee.  
    c. Salt and coffee.

The remainder of this chapter we suggest one possible approach to deriving this result.

**A syntax for AGENT**  

In the “Principles and Parameters” approach to linguistics (cf. Chomsky and Lasnik 1993), it is hypothesized that the natural languages of the world differ from each other in terms of

---

64 In different versions of our questionnaire, this situation was presented as in (i), where the three voyages of boat C are listed in a single line. Presenting the situation as in (i) probably reduces the saliency of the repetition and, thus, visually “primes” the individual answer.

(i)  
A: oats, salt.  
B: oats.  
C, voy. 1, 2 & 3: oats, coffee.
their “values” on a discrete number of parameters. One of these parameters is \textit{wh}-raising. \textit{Wh}-raising is a possibility for human languages. A language with a positive value on this parameter will show (overt) \textit{wh}-raising; a language with a negative value will not. Now, a parameter, \textit{a priori}, can take only one value. This means that French cannot simultaneously be [+ \textit{wh}-raising] and [- \textit{wh}-raising], \textit{pace} Aoun et al (1981) and Lasnik and Saito (1992). We simply do not expect to find genuine optionality in human language. In what follows we explore the hypothesis that French, like English, is [+ \textit{wh}-raising] -- a \textit{wh}-phrase always raises, \textit{sans exception} (cf. Mathieu 2004).

In English, a \textit{wh}-phrase may remain in-situ at PF just in case another \textit{wh}-phrase in the same sentence has undergone \textit{wh}-raising, as in (32).

32. Who brought what?

Our hypothesis is that this is exactly what is happening in French. It is simply that, in the case of French, the “first” \textit{wh}-phrase has no phonetic exponence (\(\Pi = /\emptyset/\)). We invoke the vocabulary of Minimalism in order to elaborate this proposal; as far as we can tell, however, nothing hinges on this choice.

According to Ishii (2006), \textit{wh}-movement can be accounted for in Minimalist terms as follows. What is to be accounted for is overt \textit{wh}-movement to the specifier of an interrogative C. We assume that C has uninterpretable \textit{wh}- and EPP features; the \textit{wh}-phrase has interpretable \textit{wh}-features. Uninterpretable features must be deleted or the derivation will crash. The \textit{wh}-feature on C acts as a probe – it scans its c-command domain for a matching feature (a goal). The \textit{wh}-feature of C enters into a matching relation with the interpretable \textit{wh}-feature of the \textit{wh}-phrase. The former can then undergo deletion. The interpretable \textit{wh}-feature of the \textit{wh}-phrase remains. The uninterpretable EPP-feature of C is a selectional feature. It can merge with the \textit{wh}-phrase in Spec, C. It then undergoes deletion.

What is the content of a \textit{wh}-word? We argue that, like an indefinite, a \textit{wh}-phrase
contributes a variable and a condition on that variable. So, for example, the indefinite *a rabbit* contributes a variable together with the condition that that variable be assigned to no individual that is not a rabbit. The *wh*-phrase *which rabbit* also contributes a variable and the condition that that variable be assigned to no individual that is not a rabbit. The difference between the two is that *which rabbit*, but not *a rabbit*, is has a (interpretable) [+Q] feature. The relationship between *something* and *what* is analogous. Both contribute a variable together with the condition that that variable be assigned to no individual that is not a thing. The difference is that *what* but not *something* is has a [+Q] feature. So, we can understand *something* as the spell-out of *a thing* and *what* as the spell-out of *a thing* [+Q].

*Which N* would be the spell out of *a thing* [+Q] together with the further condition that the thing be an N. Let’s recall now our definition of *AGENT*. *AGENT*, we said, contributes a pair of variables, <x,e>, together with the conditions that the first of these not be assigned to an individual that is not a thing and that the second not be assigned to an individual that is not an event. *AGENT* imposes a further condition that the value of the first not be assigned to an individual that is not in a certain relationship with the value of the second. It is possible, then, to understand *AGENT* as meaning something like *some-thing/event*; *WH-AGENT* (*AGENT* [+Q]), then, would mean something like *which-thing/event*. Both impose a further condition on the relation between the two variables. In sum, we suggest that, if *a N* is an existential quantifier over individuals and *which N* is an interrogative quantifier over individuals, *AGENT* and *WH-AGENT* are existential and interrogative quantifiers over <individual, event> pairs.

Now, consider the point in the syntactic derivation at which C is merged. (33) shows what happens in the case of the ungrammatical *Peu de bateaux ont transporté quoi?* (“What did few ships transport?”)

33. [C [vP peu de bateaux [v *WH-AGENT*]][vP quoi [v transporter]])

We said that C has uninterpretable wh- features and that this causes it to scan its c-command domain for a goal. *WH-AGENT*, in v, is closer to C than is the *wh*-phrase in the VP. “Attract closest” requires that C enter into a matching relationship with *WH-AGENT*. As
a result, *quoi*’s wh-features go unchecked and the derivation crashes.

The raised construction, in comparison, does not involve event quantification: raised constructions quantify over individuals. We have argued that *WH-AGENT* is an element of event quantification but not of individual quantification. Thus, *WH-AGENT* will not appear in the derivation of the raised question, *Qu’est-ce que peu de bateaux ont transporté?* (“What did few boats transport?”). Nothing interferes with *C* and *quoi* entering into a checking relation.

We started by accepting the orthodox assumption that overt movement blocks covert movement. In our story, however, it seems that something a little more -- or maybe a little less -- subtle is going on. We found not that overt movement blocks covert movement, but that overt movement blocks overt movement: the overt movement of a phonetically defective lexical item (*WH-AGENT*) blocks the overt movement of a phonetically contentful lexical item (*quoi*). A question for future research is whether other instances of covert movement blocking overt movement might be amenable to an analysis along the lines pursued in this section.

**Split quantifier constructions**

It is standard in French, as in English, to raise Quantifier Phrases to clause-initial position, as in (34)

34. **Combin** de livres as-tu lu?

   How-many of books have you read

   “How many books did you read?”

---

65 Recall in section 3.2.2.3 we showed that our French informants strongly prefer the individual reading for *Qu’est-ce que peu de bateaux ont transporté?* (“What did few boats transport?”). In the situation in (29), boat A transported oats and salt, boat B transported oats, and boat C transported oats and coffee; boats A and B made one voyage each, while boat C made three. So, there were three events of coffee transport but only one boat that transported coffee. If informants were counting individuals (boats), coffee would be on par with salt -- only one boat is such that it transported coffee. If informants are counting events (voyages), however, the best answer to *What did few boats transport?* is salt simpliciter -- salt is the only item that was transported on few voyages. That informants strongly preferred the individual answer, *salt and coffee* would seem to indicate that the question quantifies over individuals and not over events.
It is sometimes possible, however, to “split” the QP, raising the quantifier but leaving the DP in-situ, as in (35).

35. **Combien** as- tu lu **de livres**?
   How-many have you read of books
   “How many books did you read?”

Kayne (1989) points out that only non-split construction does the verb agree with the object. For example, in (36a) the feminine plural *boîtes* (“boxes”) raises with *combien*, while in (36b) it remains in-situ. Only in the first case does the verb agree.

36. a. **Combien** de *boîtes* as- tu ouvertes?
   How-many of boxes$_{FP}$ have you opened$_{FP}$
   “How many boxes did you open?”

   b. **Combien** as- tu ouvert de *boîtes*?
   How-many have you opened of boxes$_{FP}$
   “How many boxes did you open?”

Rizzi (1990) observes that split *combien de* constructions exhibit Weak Islands. In (37), while negation doesn’t compromise the grammaticality of the raised construction, (a), the split construction, (b), is ungrammatical.

37. a. **Combien** de *livres* n’ as- tu *pas* lus?
   how-many of books N have-you not read
   “How many books didn’t you read?”

   b. *Combien* n’as- tu *pas* lu de *livres*?
   how-many N have-you not read of books
   “How many books didn’t you read?”
DeSwart (1992) shows that the same effect can be observed in German and Dutch split quantifier constructions with *was fur* and *wat voor*.

What is interesting for the purposes of this investigation is that, in French, split quantifier constructions appear to pattern with in-situ questions. We have already shown that, like in-situ questions, split quantifier questions are subject to IEs. Further, like in-situ questions, split quantifier questions are unambiguous, are not possible where the agent is questioned, are degraded with i-level as opposed to stage-level predicates, and are degraded where an adjunct as opposed to an argument is questioned. We borrow examples from Mathieu (2004) to illustrate these four claims.

First, both split quantifier and in-situ questions are subject to IEs. (38a) gives the raised un-split construction, (38b) the raised split construction and (38c) the in-situ construction.

38. a. **Combien** de livres est-ce que seulement Marie a lu?
   How-many of books is-it that only Mary has read
   “How many books did only Mary read?”

   b. *Combien* est-ce que seulement Marie a lu de livres?
   How-many is-it that only Mary has read of books
   “How many books did only Mary read?”

   c. *Seulement Marie a lu **combien** de livres?*
   Only Mary has read how-many of books
   “How many books did only Mary read?”

Second, both split quantifier and in-situ questions are unambiguous – they have a PLR but no individual reading. The split and in-situ examples, (39b) and (39c), have a set-of-questions reading: tell me, for each member of the subject set, what is the number of books he or she read? Unlike (39a), however, (39b) and (39c) do not have a “narrow scope”
reading for the existential: (39b) and (39c) cannot be interpreted: tell me what number of books is such that all the members of the subject set read that many books.

39. a. **Combien** de livres ont-ils tous lus? PLR, IR
    How-many of books have-they all read
    “How many books did they all read?”

   b. **Combien** ont-ils tous lu de livres? PLR, *IR
    How-many have-they all read of books
    “How many books did they all read?”

   c. Ils ont tous lu **combien** de livres? PLR, *IR
    They have all read how-many of books
    “How many books did they all read?”

Third, neither split quantifier nor in-situ questions are possible where the agent is questioned, as (40b) and (40c) show, respectively. Split quantifier and in-situ questions are possible where the theme is questioned, as (41a) and (41b) show. At issue is not the grammatical function of the phrase (subject/object), but its thematic role. The subjects of unaccusative verbs like *come* and *enter* are themes, not agents. As (42) shows, split quantifier constructions are possible where the subject of an unaccusative verb is questioned. The series (43a-c) shows the same is the case for in-situ questions. The subject of the verb *éternuer* (“to sneeze”) is, thematically, an agent: the raised (a) but not the in-situ (b) variant of “Who did he say sneezed?” is grammatical. In contrast, the subject of the verb *entrer* (“to come in”) is, thematically, a theme: the in situ variant of “Who did he say came in?” is fine.

40. a. **Combien** de personnes ont rigolé?
    How many of people have had-fun
    “How many people had fun?”
b. *Ils ont rigolé combien de personnes?
   They have had-fun how-many of people
   “How many people had fun?”

c. *Combien ont rigolé de personnes?
   How-many have had-fun of people
   “How many people had fun?”

41. a. Combien as-tu vu de personnes?
   How-many have-you seen of people
   “How many people did you see?”

b. Tu as vu combien de personnes?
   You have seen how-many of people
   “How many people did you see?”

42. Combien sont arrivés d’étudiants?
   How-many have come of students
   “How many students came?”

43. a. Qui est-ce qu’il a dit qui a éternué?
   Who-is-it that he has said that has sneezed
   “Who did he say sneezed?”

b. *Il a dit que qui avait éternué?
   He has said that who had sneezed
   “Who did he say sneezed?”

c. Il a dit que qui est entré dans le cinéma?
   He has said that who is come in the theatre
   “Who did he say came into the theatre?”
Both split quantifier and in-situ questions are degraded with individual-level compared to stage-level predicates. For example, (44a), a split quantifier question with the i-level predicate *love*, is degraded compared to its counterpart in (44b) with the s-level predicate *see*. And (45b), an in-situ question with the i-level *love* is degraded compared to (45d), with the s-level *see*. Further, both split quantifier constructions and in-situ questions are also degraded where an adjunct is questioned, as compared to where an argument is questioned. (46b), for example, where *où* (“where”) figures as an adjunct is degraded compared to (46d) where it figures as an argument.

44. a. ?*Combien*  adores/connais-tu  de personnes?
   How-many love/ know- you of people
   “How many people do you love/know?”

   b.  *Combien*  vois-tu  de personnes?
   How-many see- you of people
   “How many people do you see?”

45. a.  *Qu’est-ce que* tu  adores/connais?
   What is-it that you love/ know?
   “What do you love/know?”

   b.  ?*Tu*  adores/connais quel?
   You love/ know what
   “What do you love/know?”

   c.  *Qu’est-ce que* tu  vois?
   What is-it that you see
   “What do you see?”

   d.  *Tu*  vois quel?
You see what
“What do you see?”

46. a. Où vas-tu?
Where go-you
“What are you going?”

b. Tu vas où?
You go where
“What are you going?”

c. Où as-tu vu un piano?
Where have-you seen a piano
“What did you see a piano?”

d. ?*Tu as vu un piano où?
You have seen a piano where
“What did you see a piano?”

Finally, the questioned object in-situ questions is unambiguous, having a specific reading but not a kind reading. This is not the case in raised questions. Matthieu (2003) points out that Tu as bu quelle bière? may be interpreted to mean which beer out of a particular set of beers did you drink but not which kind of beer out of a set of beer-kinds did you drink? Similarly, comment (“how”) and pour quoi (“why”) are unambiguous in in-situ questions. The former cannot be interpreted as asking for a state; the latter cannot be interpreted as asking for a reason, as (47) and (48) show.

47. Tu es arrivé comment? En voiture. *Fatigué
You are come how In car Tired
48. Tu es parti pour quoi/*pourquoi?
   You are left for what why
   “What caused you to leave?” *“Why did you leave?”

In French, it is perfectly natural to say *Il est arrivé fatigué* ("He arrived tired.") *Fatigué* specifies the state he was in when he arrived. However, the question *Il est arrivé comment?* (the in-situ variant of “How did he arrive?”), would never solicit the response *Fatigué* ("Tired.") When it appears in-situ as in (47), *comment* is unambiguous: it asks only for a means.

We have already argued that raised questions quantify over individuals while in-situ questions quantify over events. We then observed that split quantifier questions pattern with in-situ questions in that both are subject to IEs; both have PL but not individual readings; while neither is possible where the agent is questioned, both are possible where the theme is questioned, even when the theme figures as the grammatical subject of the sentence; both are degraded when adjuncts as compared to arguments are questioned. This, we argue, suggests that split quantifier questions, too, quantify over events. All of these facts, as well as the fact that split constructions have a specific but not a kind reading, fall out if we assume that split quantifier constructions, like in-situ questions involve quantification over events.

Let’s look at how the PLR for (39b) (*Combien ont-ils tous lu de livres?* ("How many books did they all read?")) would be generated. We said that when questions quantify over events, the whole of the question minus the questioned element maps to the restrictor and that the whole question, including the questioned element, maps to the nuclear scope. That would give us something like (49).

\[
49. \left[ \exists e. \text{READ}(e) \land \text{AGENT}(e, \text{ATOM}'(\text{them})) \right] \\
\left[ \text{NS} \exists e. \text{READ}(e) \land \text{AGENT}(e, \text{ATOM}'(\text{them}) \land \text{THEME}(e, n \text{ books}) \right]
\]

ATOM’ can pick out individuals from the complex referential *ils* ("they"). Events are
identified by naming the cardinality of their themes. A family of questions will be
generated containing as many questions as they has atoms: \{a read n books, b read m books
\ldots \}.

Our explanation for the “agent-theme asymmetry” follows naturally from our account of
the distribution of PLRs. PLRs, we said, are only possible with referential (type <d>)
subjects, because only these can supply arguments for \text{AGENT}. Let’s look at what happens
when we try to plug (40c), repeated below as (50), into our event quantification frame. As
(51) shows, \(n\) people, a quantifier, figures as the argument of \text{ATOM’}. We have a type
mismatch. The same thing that blocks PLRs with quantificational subjects blocks split
quantifier questions with quantificational agents.

\begin{verbatim}
50. *Combien ont rigolé de personnes?
   “How many people had fun?”
\end{verbatim}

\begin{verbatim}
51. \[R\exists e.\text{HAVE-FUN}(e)]
\[NS \exists e.\text{HAVE-FUN}(e) \land \text{AGENT} \,(e,\text{ATOM’} \,(n \text{ people}) \,] \]
\end{verbatim}

That the arguments of event role predicates must be referential would also seem to explain
why themes in split quantifier constructions have a specific but not a kind reading.

Now, if split constructions are nevertheless possible with unaccusative verbs, we might
expect that IEs would be ameliorated with unaccusatives. This predicts, for example, that
(52a) will be less degraded than (52b). We leave it for the reader to judge whether this
prediction is born out.

\begin{verbatim}
52. a. Did only Jane or Mary come?
   b. Did only Jane or Mary fix her bike?
\end{verbatim}
Our explanation for the adjunct-argument asymmetry will be developed in the context of our discussion of WIs in Chapter V.

**Summary of Chapter 4**

We argued that in-situ questions quantify over events. We pointed out that the answerhood conditions of an in-situ question are those of the event reading of the question, while the answerhood conditions of a raised question are those of its individual reading. Like many who have already studied this question, we suggested that IEs result where some element intervenes to block feature movement. In our version of the story, the “culprit” is *WH-AGENT*, the interrogative counterpart of AGENT. Because *WH-AGENT* is involved in event quantification but not individual quantification, IEs will not result where questions quantify over individuals. We reviewed some similarities in the behavior of in-situ questions and split quantifier questions and suggested that the behavior of the latter, too, could be attributed to event quantification.
APPENDIX: French and Portuguese inference pattern questionnaires

FRENCH

Is there a presupposition in either (a) or (b) that Jean and Maria saw the same person (together)?

a. Jacques et Amélie ont vu qui ?

b. Qui est-ce que Jacques et Amélie ont vu ?

Consider the following situation. In this situation do the two questions below elicit the same responses? Are both answers below possible answers to both questions? Or are there question-answer pairs that go more naturally together?

Situation :

Il y a trois bateaux, A, B et C. A et B ont fait un voyage chacun.

C en a fait deux. Ils transportaient :

A: de l’avoine.

B: de l’avoine.

C, voy. 1: de l’avoine.

C, voy. 2: du café.

Questions :

a. Qu’est-ce que les trois bateaux transportaient?

b. Les trois bateaux transportaient quoi?

Answers :

a. De l’avoine et du café.

b. De l’avoine.
Consider the following situation. In this situation, is one or the other of the answers below more natural? Are both answers possible?

Situation :
Il y a trois bateaux, A, B et C. A et B ont fait un voyage chacun. C en a fait trois. Ils transportaient:

A: de l’avoine, du sel.
B: de l’avoine.
C, voy. 1, 2, 3 : de l’avoine, du café

Question :
Qu’est-ce que peu de bateaux ont transporté?

Réponses :

a. Du sel.
b. Du café.
c. Du sel et du café.
PORTUGUESE

Is there a presupposition in either (a) or (b) that Jean and Maria saw the same person (together)?

a. Jean e Maria encontraram quem?
   b. Quem encontraram Jean e Maria?

Consider the following situation. In this situation do the two questions below elicit the same responses? Are both answers below possible answers to both questions? Or are there question-answer pairs that go more naturally together?

Situation:
Há três barcos, A, B e C. A e C fizeram uma viagem cada e C fez duas. Transportaram:

A: aveia
B: aveia.
C, viagem 1: aveia.
C, viagem 2: café.

Questions:
   a. O que é que os três barcos transportaram?
   b. Os três barcos transportaram o quê?

Answers:
   a. aveia e café.
   b. aveia.

Consider the following situation. In this situation, is one or the other of the answers below more natural? Are both answers possible?
Situation:
Há três barcos, A, B e C. A e C fizeram uma viagem cada e C fez três. Transportaram:

A: aveia e sal
B: aveia.
C, voy. 1, 2, 3: aveia e café.

Question:
O que é que poucos barcos transportaram?

Answers:
a. Sal.
b. Café.
c. Sal e café.
Chapter 5. Weak Islands

WIs: Data

(1b) is often diagnosed as a Weak Island violation. WIs are syntactic environments that permit the extraction of some *wh*-Ps (*what, who*) but not others (*how, why*). In (1) the *wh*-phrases *which man* and *how* are extracted from their base position (indicated “__”) over *not*. In the case of the *which*-P the result is grammatical; in the case of the *how*-P it isn’t.

1. a. Which book didn’t you read __?
   b. *How didn’t you fix the car __?

(2) and (3) supply further examples of WI violations. (2b), like (1b) is a “scope island” violation (the *wh*-phrase is raised over a “Scopal Element” (SE), in this case, *more/fewer than five students* (cf. section 2.2 below)); (3b) is a “*wh*-island” violation (the *wh*-phrase is raised over another *wh*-phrase, in this case, *whether*).

2. a. Which teacher did *more/fewer than five* students invite?
   b. *How did *more/fewer than five* students behave?  (Honcoop 1998:4)

3. a. Which man are you wondering *whether* to invite __?
   b. *How are you wondering *whether* to behave __?  (Honcoop 1998:3)

Presuppositional verbs are also said to create WIs. Factive verbs like *regret, know* and *realize* as well as others like *deny* and *agree* presuppose the truth of their complement clause. As (4) shows, it is possible to extract a *which*-P but not a *how*-P over a verb in this class.⁶⁶

---

⁶⁶ I will not be offering any explanation for the data in (4). The puzzle with which (4) presents us is that of why, although some *wh*-Ps can raise over factive verbs (and, by implication, non-factive verbs), other *wh*-Ps can not raise over factive verbs (and, by implication, only over non-factive verbs). I am unable to persuade myself that sentences where *how*-Ps and other “adverbial *wh*-Ps” raise over factive verbs are any more degraded than those in which they raise over non-factive verbs. Compare (ia), repeating (4b), where *how* raises over the factive *regret/know/realize* and the minimally different (ib) where *how* raises over the non-factive *hope/believe/imagine.*
4.  a. Which man do you regret/know/realize that I invited __?
    b. *How do you regret/know/realize that I behaved __?

(Honcoop 1998:4-5)

**Extant analyses**

Honcoop (1998) and Szabolcsi and Zwarts (1991, 1993, 1997, Szabolcsi 1999) offer the most developed semantic accounts of WIs. We summarize their analyses below.

Honcoop’s is a dynamic account. According to Honcoop it is the (non)availability of “Existential Disclosure” that accounts for WIs. Szabolcsi and Zwarts offer an algebraic account.

**Honcoop**

Honcoop relies on the Dynamic Predicate Logic (DPL) of Groenendijk and Stokhoff (1991). While in so-called static logics the syntactic scope of an operator determines its semantic scope, in dynamic logics the two are not necessarily coterminous. Whereas in static logics the scope of an operator cannot extend “beyond the period,” in DPL the scope of existential quantifiers can be extended indefinitely to the right. This theorem of DPL is given in (5a); (5b) supplies an example.

5.  a. $\exists x (\Phi \land \Psi) \leftrightarrow \exists x (\Phi \land \Psi)$
    
    b. A woman came in. She left her parasol by the door.
       $\exists x (\text{woman'}(x) \land \text{come-in}(x)) \land (\text{left-her-parasol}(x)) \leftrightarrow$
       $\exists x (\text{woman'}(x) \land \text{come-in}(x) \land \text{left-her-parasol}(x))$

(i)  a. ??How do you regret/know/realize that I behaved?
    b. ??How do you hope/believe/imagine that I behaved?

Speakers have much less trouble judging these examples when the complementizer is eliminated. (ia’) and (ib’) differ minimally from (ia) and (ib): the latter but not the former include the complementizer that. Speakers who do not find that (ia) and (ib) contrast in terms of their grammaticality do find that the (ia) and (ia’) and (ib) and (ib’) do.

(i)  a’. ??How do you regret/know/realize I behaved?
    b’. ??How do you hope/believe/imagine I behaved?
This accounts for why indefinites like *a new coat* and *a man* in (6a) and (7a) can bind pronouns like *it* and *he* that are outside of their syntactic scope. Indefinites introduce discourse referents that are exceptionally available to anaphora, as in (6a) and (7a). Normally, anaphoric dependencies cannot be created between an element and anaphora it doesn’t c-command. In practice, this means that anaphoric dependencies cannot extend across sentential boundaries. In (6a), however, it seems that *it* is unproblematically coindexed with *a new coat*.

Under some circumstances, however, an indefinite becomes inaccessible to non-c-commanded anaphora, as in (6b) and (7b), where the indefinites *a new coat* and *a man* are bounded by *every* and *not*, respectively.

6. a. I have [a new coat]. *It* is grey.
   b. *Every* boy has [a new coat]. *It* is grey.

7. a. I saw [a man] in the park. *He* was strolling alone.
   b. *I didn’t see* [a man] in the park. *He* was strolling alone.

Honcoop suggests that the elements that give rise to intervention effects are precisely those that, like *every* and *no*, make indefinites unavailable to discourse anaphora – the dynamically closed operators. The offending configuration is sketched in (8), where Op is a weak island inducer.

8. *... Q_i[Φ... [Operator... indefinite]...*

Honcoop’s explanation relies on Existential Disclosure (ED). In dynamic semantics as elaborated by Groenendijk and Stokhoff (1991), indefinites are analyzed uniformly as introducing existential quantifiers. ED allows for the removal of an existential quantifier where the interpretive procedure requires it. For example, in the case of (9), Irene Heim’s (1982) famous example, ED applies to turn *a cat*, a QP in the DPL schema, into an NP –
i.e. a property, the kind of entity that can function as a restrictor for a quantifier, here *usually*.

9. Usually, a cat is independent.

Examples like (10) pose a problem for this analysis, however. In (10), an example from Chierchia (1995), the indefinite is bound by an adverbial quantifier.

10. a. Usually, if a man drinks he gets drunk.
    
    b. \( \forall i(\exists x: \text{man}(x) \land \text{drinks}(x)) \rightarrow \text{drunk}(i) \)
    
    c. \( \forall i(\exists x: \text{man}(x) \land \text{drinks}(x) \land x = i) \rightarrow \text{drunk}(i) \)

If indefinites are uniformly analyzed as existential quantifiers, there is no necessary connection between the drinker and the drunk in (10a), as represented in (10b). But this doesn’t correspond to our intuitions with regard to the meaning of sentences like this one. ED asserts the equivalence of the two variables, “disclosing the identity” of the existentially quantified variable, as in (10c). The definition of ED is given in (11).

11. \( \lambda x(\Phi) =_{\text{def}} \lambda x'((x \Lambda \uparrow x = x') \)

Any operator that, like *usually* above, blocks ED is referred to as “dynamically closed.” Dynamically closed operators, in effect, intervene to take the \( x = i \) in (10c) out of the scope of the existential. We are then left with an unbound variable – and an uninterpretable structure.

Honcoop argues that WIs result where the interpretation of an expression requires the removal of an existential quantifier (i.e. the application of ED). The operators which create WIs, then, are those which create an inaccessible domain for dynamic anaphora and thus block ED.
Honcoop elaborates his approach via the discussion of the *What for*-split in Dutch and other Germanic languages. In Dutch, there are two ways of forming a *wh*-interrogative with the complex *wh*-determiner *wat voor* (literally “what for,” meaning “what kind of”). The whole phrase may be fronted to sentence-initial position, as in (12a), or *wat* alone is fronted leaving *voor*+NP in its base position, as in (12b). Only the split construction is ungrammatical, as (13) shows.

12. a. *Wat voor een boek* heeft Jan gelezen?
   what for a book has Jan read
   “What kind of book did Jan read?”

   b. *Wat* heeft Jan *voor een boek* gelezen?
   what has Jan for a book read
   “What kind of book did Jan read?”

13. a. *Wat voor een boek* hoeft [niemand _ te lezen]?
   what for a book has no one to read
   “What kind of a book does no one have to read?”

   b. *Wat* hoeft [niemand _ *voor een boek* te lezen]?
   what has no one for a book to read
   “What kind of a book does no one have to read?”

If the indefinite *een boek* is to be construed as a property restricting the range of the variable quantified-over by the *wh*-quantifier *wat*, ED must apply to dissolve the existential quantifier. In (13a) this happens unproblematically; in (13b) *niemand* (“no one”) intervenes.

Honcoop points out that if the only thing at stake were the logical properties of the restricting expression we should find no difference in grammaticality between the split and the unsplit constructions. This is not the case. Where *voor*+NP raises with *wat*, negation
does not compromise grammaticality. Exclusively semantic accounts – like Szabolcsi and Zwarts – will have a hard time accounting for this difference.

**Szabolcsi**

Szabolcsi and Zwarts (1991, 1993, 1997) refer to elements that can give rise to scopal ambiguities as Scopal Elements (SEs). In our discussion of scope in Chapter 2, we pointed out that sentences like (14) can be ambiguous.


(14) can be interpreted to mean either that there is a certain book that all the boys read or that every boy read a potentially different book. In the first case the existential \( a \) is said to take scope over the universal \( \text{every} \); in the second it is the universal that takes wide scope. \( A \) and \( \text{every} \) and other lexical items that “take scope” like this are SEs.

SEs are associated with different Boolean operations. Negation corresponds to *complementation* (predicate logically, \( \neg \)), universal quantification to *meet* (\( \Lambda \), set intersection) and existential quantification to *join* (\( V \), set union). Monotone increasing numerical quantifiers will be associated with different combinations of intersection and union, and monotone-decreasing and non-monotone quantifiers with different combinations of intersection and complement. Szabolcsi and Zwarts argue that a \( \text{wh} \)-P cannot take scope over an expression associated with a Boolean operation which is not defined in that structure.

Let’s look at an example. Given a universe that contains just three cats, Annabel, Boots, and Conan, *Every cat meowed* corresponds to the meet of the three singular propositions \( A \ meowed, B \ meowed \) and \( C \ meowed \), as in (15a). *A cat meowed* corresponds to the join of the same three propositions, as in (15b).

15. a. \( M(a) \ \Lambda \ M(b) \ \Lambda \ M(c) \)
   b. \( M(a) \ \vee \ M(b) \ \vee \ M(c) \)
In this system, in order to answer a question like *Which of the other cats does A like?* we construct the set of cats that A likes. To answer *Which of the other cats doesn’t A like?* we take the complement of the set we constructed to answer *Who does A like?* To answer *Which cats does no cat like?* we would have to take the complement of the union of the three sets, who A likes, who B likes and who C likes.

These operations are possible because the elements of the domain in which *who* denotes are individuals. Individuals can be collected into unordered sets. The power set of any set of individuals forms a Boolean algebra. Thus all Boolean operations will be defined on sets of individuals. In the example above, the set of those who A likes has a genuine complement – we can enumerate the members of the domain that are not in the set L(x,a). In contrast, partially ordered sets closed only under meet and join or join only (proper lattices and semi-lattices respectively) do not admit all Boolean operations.\(^{67}\) This is the case, for example, for propositions,\(^{68}\) amounts and manners,\(^{69}\) which denote in join semilattices.

Take the question of how Jane fixed her bicycle. In theory our answer might be thought of as a single-member set – the manner from the set of manners in which someone might fix her bicycle in which Jane actually fixed her bicycle. Nevertheless, Szabolcsi and Zwarts argue that the domain of manners lacks a bottom element. This means that the meet operation is undefined in this domain. For a domain to be closed under a Boolean operation, the result of applying that operation to any element of that domain must also be a member of that domain. In the case of the domain of manners, if we were to take the meet of two disjoint sets – in this case, say, \{handily\} and \{with a little help from her friends\} --

\(^{67}\) Even in the case of an ordered domain, an intervener will be harmless if (1) it is scopeless; (2) it can take WS over the *wh*-P (in which case it gives rise to a family-of-questions reading; or (3) if it can participate in a scope-independent (branching, cumulative) reading. Typically this is the case only for upward monotonic items. Principal ultrafilters (=names) are scopeless. GQs – like definites and universals -- with unique, non-empty witnesses give rise to a choice (pair-list) reading.

\(^{68}\) The domain in which *why* denotes. It is ordered by entailment (inclusion).

\(^{69}\) According to Szabolcsi and Zwarts, the components of the manner characterizing each event do not form a set but a sum.
we would have an empty set, and our domain does not include the empty set, by assumption. This predicts that how – a manner adverb -- will not scope over a universal quantifier or any other SE that involves meet or complement. This accounts for the contrast in (16).

16. a. **Which** book did everyone read?
   b. *How* did everyone fix the car?

Now, unlike how, how many, may range over a proper lattice, defined for meet and join. We thus predict that how many, unlike how, should be able to take WS over a universally quantified NP. Indeed, (17b), unlike (17a), can have the single constituent reading that would result from how many taking WS.

17. a. **How** did everyone behave?
    Pair-list reading: For every person x, how did x behave?
    Presupposed uniformity reading: What was the uniform behavior of everyone?
    *Single-constituent reading: For what manner m did everybody behave in m manner?

   b. **How many** problems did every student solve?
    Single-constituent reading: For what number x did every student solve x problems?

This approach would predict that non-Boolean expressions like singular referential terms should not give rise to IEs. (18) seems to bear this out.

70 According to Link (1983), collectives – like manner and amounts -- form join semi-lattices. This predicts that a wh-P that ranges over collective NPs will be sensitive to IEs. Assuming that a house can only be destroyed once, the VP forces a collective reading of the subject NP in (i.b).

(i) a. Which soldiers didn’t visit this house?
   b. Which soldiers didn’t destroy this house?

According to Szabolcsi and Zwarts, so-called one-time only predicates have necessarily unique arguments and adjuncts. Only iterable predicates can scope over negation or a universal quantifier.
18. **How** did John/that man behave?

Further, although intensional verbs participate in scopal ambiguities, they do not seem to trigger intervention effects, as (19) shows. Szabolcsi and Zwarts explain that intensionals make no Boolean contribution.

19. **How** did John **want** to repair the car? (want › how)

Honcoop, recall, argued that WIs result where a dynamically closed operator (an operator that creates an inaccessible domain for dynamic anaphora) blocks existential disclosure. In S&Z’s analysis, WIs are a product of an incompatibility between the Boolean operations performed by an operator and the operations that are defined in the domain of the interrogative: a *wh*-P cannot take scope over an expression associated with a Boolean operation which is not defined in that structure. Like S&Z, we argue that what allows *which, what* and *who* “to go” where *when, how* and the rest can’t is the fact that the former but not the latter denote in the domain of individuals. Like Honcoop, we argue that WIs “happen” in the syntax. Thus, like S&Z, we are able to account for the differences in the acceptability of, for example, *how* and *how-many* questions; and, like Honcoop, we are able to account for the differences in acceptability of split and non-split constructions. We argue that WIs result where event quantification is “forced but impossible.” WIs result where semantics of the *wh*-element (its type) forces quantification over events but the semantics of the quantifier (its type) precludes it.

**Analysis**

We have argued that to account for the various “quirks” of quantified questions we need to consider two parameters: the domain of quantification (events/individuals) and the type of the subject QP (referential/quantificational). Where quantification is over events and the
QP is referential, a PL reading results. Quantification over individuals results in an individual reading, whether the QP is referential or quantitative. Where quantification over individuals is unavailable, a question with a genuinely quantificational QP will not be interpretable. This is the constellation that is responsible for WIs. We argue that in the relevant sentences quantification over individuals is not possible because the questioned element – time, place, manner, reason – is a predicate defined only for events.

**Recap: Quantitative QPs are incompatible with event quantification**

We argued in Chapter III that PLRs are not available with genuinely quantitative DPs. PLRs involve quantification over events and quantification over events is only possible where the subject QP is referential, type <d>. Only elements of type <d> can fill event roles. It is event quantification that produces PLRs, we argued. Thus, PLRs are only available where event quantification is. This explains, for example, the availability of a PLR in (20a) but not in (20b).

20. a. What did the two girls see in Santa Cruz?
   Asha saw the elephant seals and Binh saw the butterflies.
   b. What did most girls see in Santa Cruz?
   #Asha saw the elephant seals, Binh saw the butterflies, Carling saw . . .

**Manner, reason, time and place questions quantify over events exclusively**

Although no PLR is available for (20b), the question is still grammatical. This, we argued, is because an alternative to event quantification is available: individual quantification. In (20b) this yields a question that asks what individual \( x \) is such that most girls saw it. A possible answer would be *Most girls saw the elephant seals*. Quantification over individuals is not possible in all cases, however. We hypothesize that while *which* N, *what* and *who* questions lend themselves to individual quantification, *how, why, when* and *where* questions do not. Compare, in this regard (21a) with (21b) and (22a) with (22b).

21. a. What did many girls see in Santa Cruz?
   b. ??How did many girls get to Santa Cruz?
22.  a. Who did few girls believe?
      b. ??Why did few girls believe the story?

We want to argue that manner, reason, time and place clauses modify events: they are predicates that are defined only for events – type \( <v, vt> \). In the case of how, why, when and where questions, no alternative to event quantification is available. Thus, for the same reason PLRs are only available with non-quantificational subjects, how, why, when and where questions will only be possible with non-quantificational subjects.

Three predictions and three tests

This analysis makes three testable predictions. First, in every case that a how, why, when or where question (herafter “adverbial question”) is grammatical, a PLR should be available. Second, in every case where an adverbial question is grammatical, the event reading should be overwhelmingly preferred over the individual reading. Third, WI violations should be ameliorated with universal quantifiers.

First prediction/test

Our first prediction was that in every case that an adverbial question was grammatical, a PLR would be available. Replace the quantificational many girls and few girls in the how- and why-questions in (21b) and (22b) with the referential the two girls. This substitution produces two perfectly good sentences with PLRs, as (23) and (24) show.

23. How did the two girls get to Santa Cruz?
    Joo-Hyun took the 17 Express
    and Seema rode her bicycle down Empire Grade.

24. Why did the two girls believe the story?
    Joo-Hyun believed it because she believes everything she hears on NPR
    and Seema believed it because she believes everything Joo-Hyun does.

Second prediction/test

Our second prediction was that in every case where an adverbial question was grammatical, the event reading would be overwhelmingly preferred over the individual reading. We
reasoned that if, indeed, adverbial questions quantified exclusively over events, in situations in which the individual reading could be distinguished from the event reading, the former should be much “harder to get.” To test whether the event reading was indeed more readily available than the individual reading for grammatical adverbial questions, we asked our informants to consider the situation in (25). An event answer (the PLR) would name the dates on which each girl went to Santa Cruz (October 8 and December 12). The individual answer would name the “common denominator”: the time $t$ such that the two girls went to Santa Cruz at $t$ (2007). We did not at first give our informants a choice among answers; rather, we let them respond freely to the question. The result was that they volunteered the PLR, *October 8 and December 12* or *October 8, 2007 and December 12, 2007*. When informants were later asked if 2007 was an acceptable response, they did believe it was it was. One chuckled, “Oh, I didn’t see it that way. Haha. Sure.”

25. **Situation:**
Aisha went to Santa Cruz on October 8, 2007 to see the Monarch butterflies.
Binh went to Santa Cruz on December 12, 2007 to see the elephant seals.

**Question:**
When did the two girls go to Santa Cruz?

**Answers:**
a. Aisha went on October 8 and Binh went on December 12.
b. 2007.\(^{71}\)

---

\(^{71}\) In situations that test this prediction, the different event answers have a salient (immediately identifiable) “common denominator”: a single time, place, manner or reason that could theoretically serve as an answer if the question word were asking what $t$, $p$, $m$ or $r$ is such that . . .

Another situation that fulfills these criteria and could be used to test our second prediction appears in (i)

iv. Aisha worked all summer in a Japanese restaurant to make enough money to spend the fall climbing in Yosemite.
Binh worked all summer in a French restaurant to make enough money to spend the fall climbing in Yosemite.

**Question:** How did the two girls manage to spend the fall climbing in Yosemite?

**Event answer:** Aisha worked all summer in a Japanese restaurant and
Third predication/test
Our third prediction was that WI violations would be ameliorated with universal quantifiers. We saw in Chapter III that, although PLRs are not generally available with quantificational subjects, they are available with universal quantifiers. So, for example, (26a) (What did many girls see?) has no PLR in contrast, (26b), where many girls has been replaced with the universal every girl, does have a PLR. Imagine a world in which there are only three girls, A, B and C. A PL answer to (26b) – an answer of the form A saw x, B saw y, and C saw z -- is perfectly acceptable.

26. a. What did many girls see?
   b. What did every girl see?

If WIs and PLRs do indeed have a common explanation, WIs should be ameliorated in the same circumstances in which PLRs are exceptionally available. That is, we predict that universal quantifiers would not create WIs. (27) and (28) bear out this prediction.

27. a. ??How did many girls get to Santa Cruz?
   b. How did every girl get to Santa Cruz?

28. a. ??Why did most girls fix their bicycles?
   b. Why did every girl fix her bicycle?

(27a) and (28a) are classic WI examples. When we replace the QPs many girls and most girls in (27a) and (28a) with the universal every girl, the WI violations are much ameliorated. Our informants generally found them unobjectionable.72 Note that in (27b)

---
72 Of course, once informants are trained to see WI violations (which are “subtle” for non-linguists), some find them everywhere.
and (28b), as we would expect, the most readily available readings are the PLRs. The individual readings that presuppose that every girl got to Santa Cruz the same way or that every girl fixed her bicycle for the same reason are much harder to get.

Semantics

If Why did many girls go to Santa Cruz? were grammatical, it would mean something like what is the reason r such that many girls went to Santa Cruz for r? How would we represent this in lambda notation? How would we generate a set of propositions (a set of sets of worlds) of the form Many girls went to Santa Cruz for r? As a first pass, we might try something like (29).

\[ \lambda_{p} \exists r. \underbrace{p}_{\lambda_{w}. (\text{REASON(GO\_TO\_SC(many girls)), r)(w})} \]

But (29) can’t be right. First, many girls, a quantifier, occupies the place of an argument. Second, the first argument of REASON is a strange creature, indeed. What (29) asks for is not the reason for an event of going to Santa Cruz, but the reason for many-girls’-going-to-Santa-Cruz. Syntactically this would correspond to r attaching not to the vP but to the IP. As a general rule, internal arguments are “true” arguments and as such form, with verbs, units that define “complex” events; external arguments, in contrast, do not do this.

Maybe we could fix (29). One approach would be to quantify not over reasons simpliciter but over pairs of events and reasons, somewhat as we quantified over pairs of events in individuals to generate the PLR. That would give us something like (30).

\[ \lambda_{p} \exists e \exists r. \underbrace{p}_{\lambda_{w}. (\text{GO\_TO\_SC(e)} \land \text{AGENT(e, many girls)} \land \text{REASON(e, r))}}(w) \]

(30) takes care of one of the two problems we identified with (29). Unlike (29), (30) has an “orthodox” (simple) event. Like (29), however, (30) has a quantifier in the position of an argument. Maybe the problem isn’t with many girls, but with the semantics proposed in (30). No, when many girls is replaced with a referential DP, as in (31), the result is a perfectly orthodox semantics.
31. \( \lambda p \exists e \exists r. p = \lambda w. (\text{GO\_TO\_SC}(e) \land \text{AGENT}(e, a) \land \text{REASON}(e, r))(w) \).

(31) gathers propositions (sets of worlds) in which Almana goes to Santa Cruz for various reasons, as in (32).

32. \{Almana went to Santa Cruz to see the Monarch butterflies,  
    Almana went to Santa Cruz to see the elephant seals,  
    Almana went to Santa Cruz for the Dead Betty surf competition, . . .\}

Once again, a low-level type-mismatch does a lot of explanatory work. The same thing that ruled out PLR\s for quantificational DPs rules out adverbial questions (where, why, when and how questions) with quantificational DPs. Here, however, there is no alternative to event quantification. Quantification over “individual reasons” or “individual manners” is not possible. That would require construing events in a way that syntax does not construct them, as complex events composed of a verb and an external argument.

Our type-mismatch does not do the job all by itself, however. Although (33a) and (33b), for example, do not contain quantificational subject DPs, they are still catalogued as WI violations.

33. a. ??How did you never you fix your bicycle?  
b. ??Where didn’t Ming go climbing?

Continue to assume that place and manner predicates are defined for events only. What semantics can we assign to \textit{Where did Ming go climbing}? Maybe something like (34).

34. \( \lambda p \exists e \exists l. p = \lambda w. (\text{GO\_CLIMBING}(e) \land \text{AGENT}(e, m) \land \text{LOCATION}(e, l))(w) \).

Now let’s try \textit{Where didn’t Ming go climbing}? Where does negation fit it in? Do we negate the existence of an event as in (35a)? Do we make our event an event of not-
climbing, as in (35b)? Neither of these strategies is possible.

35. a. $\lambda p \neg \exists e \exists l. p = \lambda w.(\text{GO_CLIMBING}(e) \land \text{AGENT}(e, m) \land \text{LOCATION}(e, l))(w)$
    
    b. $\lambda p \exists e \exists l. p = \lambda w.(-\text{GO_CLIMBING}(e) \land \text{AGENT}(e, m) \land \text{LOCATION}(e, l))(w)$

This analysis makes a further prediction. “Non-event” questions with universal quantifiers should still show WIs. The source of the “trouble” here is not that the quantifier is of the wrong type: Ming is not a quantifier. If the “trouble” stems from non-quantification over events or quantification over non-events, replacing a quantificational subject with a universally-quantified subject should not ameliorate the violation, as it did in (27) and (28). (36) bears out this prediction.

(36) a. ??Where didn’t most/few girls climb?
    
    b. ??Where didn’t every girl climb?

Although *Why did every girl fix her bicycle?* is considerably better than *Why did few girls fix their bicycles?*, *Where didn’t every girl climb?* is every bit as bad as *Where didn’t few girls climb?* We argue that this is because (36a) and (36b) are not actually WI violations. Indeed, they are “bad” because event quantification is forced and impossible. That said, although event quantification is forced for the same reason it is in run-of-the-mill WIs (manner, reason, time and place clauses are predicates that are defined only for events – type $<v, vt>$), the reason it is impossible is different. There is no type mismatch here as there was in our WI examples. It is, rather, that event quantification is extensional: it is impossible to quantify over non-events.
Conclusion

We have contributed to the growing body of evidence, first, that natural language quantifies over (at least) two domains, viz., individuals and events and, second, that in both the verbal and nominal domain, it is necessary to employ restricted (tripartite) quantification in order to reliably account for truth conditions and patterns of inference. This is a nice, “minimalist” result: a simpler theory, one that can account for the data using a minimum of technology, is to be preferred over a more baroque theory that invokes construction- or domain-specific operations. We employed no novel analytical techniques. Our single innovation was to suggest that questions could trigger event quantification. We then explored the logical implications of this hypothesis, showing that it explains a wide range of data. In particular, it provides a uniform explanation of three phenomena formerly thought to be independent, PLRs, WIs and IEs.

We showed that two parameters are at issue: the domain being quantified over (events or individuals, E or D) and the type of the subject phrase (referential or quantificational, d or \langle d, t, t \rangle). Where quantification is over events and the QP is referential, a PL reading results. Quantification over individuals results in an individual reading, whether the QP is referential or quantitative. Where quantification over individuals is unavailable, a question with a genuinely quantificational QP will be uninterpretable. It is this constellation that gives us Weak Islands and Intervention Effects. In the first case, quantification over individuals is not possible for semantic reasons: the questioned element – time, place, manner, reason – is a predicate of events. In the second case, the reasons are syntactic: another element intervenes to prevent the in-situ question word from checking its [+Q] feature.

This information is summarized in the chart below.
<table>
<thead>
<tr>
<th>QP TYPE</th>
<th>REFERENTIAL</th>
<th>QUANTITATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>DOMAIN OF QUANTIFICATION</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>INDIVIDUALS</strong></td>
<td><strong>IND’L READING</strong></td>
<td><strong>INTERVENTION EFFECTS</strong></td>
</tr>
<tr>
<td>Q: What did the two girls see?</td>
<td>A: The elephant seals.</td>
<td>Q: *Plusieurs filles ont vu quoi? (“What did many girls see?”)</td>
</tr>
<tr>
<td><strong>EVENTS</strong></td>
<td><strong>PAIR LIST READING</strong></td>
<td><strong>WEAK ISLANDS</strong></td>
</tr>
<tr>
<td>Q: Why did the two girls go to Santa Cruz?</td>
<td>A: G1 because she’s always wanted to see the elephant seals and G2 because she wanted to make G1 happy.</td>
<td>Q: *Why did many girls go to Santa Cruz?</td>
</tr>
</tbody>
</table>
Bibliography


Aoun, Joseph (1981). The formal nature of anaphoric relations. PhD diss., MIT.


Endriss, Cornelia & Stefan Hinterwimmer (2005). Quantificational variability effects with plural definites. *Proceedings of Sinn und Bedeutung* 9. ed. by E. Maier, C. Bary & J. Huitink,


Guerzoni, Elena (in prep). Intervention effects on NPI’s and feature movement: Toward a unified account of intervention. Ms. M.I.T.


Partee, Barbara (1985). “Dependent plurals” are different from bare plurals. Lecture notes, University of Massachusetts, Amherst.


