

Contradiction and Grammar: The Case of Weak Islands

by

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Abstract

This thesis is about weak islands. Weak islands are contexts that are transparent to some but not all operator-variable dependencies. For this reason, they are also sometimes called selective islands. Some paradigmatic cases of weak island violations include the ungrammatical examples involving manner and degree extraction in (1)a and (2)a, as opposed to the acceptable questions about individuals in (1)b and (2)b:

- (1) a. *How does John regret that he fixed the car?
b. Who does John regret that he invited to the party?
- (2) a. *How much milk haven't you spilled on your shirt?
b. Which girl haven't you introduced to Mary?

The main questions that an account of weak islands should address are the following:

- ◆ What contexts create weak islands and why?
- ◆ Which expressions are sensitive to weak islands and why?
- ◆ Why do weak islands sometimes improve?

This thesis develops a semantic account for weak islands, whose core idea can be summarized as follows. What sets apart the expressions that are sensitive to weak islands from the ones that are not is that in the case of the former the domain of quantification is such that its elements stand in a particular logical relationship with each other. The island creating contexts are those in which this property of the island-sensitive expressions leads to a problem, namely a contradiction. This contradiction might manifest itself in one of two forms: In some cases, the question will presuppose that a number of mutually incompatible alternatives is true at the same time, therefore it will necessarily lead to a presupposition failure in any context. In other cases, the presupposition that there be a complete answer will not be met in any context, because the domain of question alternatives will always contain at least two alternatives that have to—but cannot—be ruled out at the same time.

The present proposal therefore fits in the family of proposals (most importantly Szabolcsi and Zwarts (1993), Honcoop (1998), Rullmann (1995), Fox and Hackl (2005)) which argue that it is independently necessary principles of semantic composition that lead to the oddness of weak islands, rather than abstract syntactic locality constraints. As such, it provides a further piece of evidence against the view which holds that principles governing the well-formedness of sentences necessarily belong to the realm of syntax as we know it. However, when we will examine the nature of the contradiction that arises in the cases of weak island violations, we will observe that it is only a special type of

contradiction—identified by Gajewski (2002) as L-analytic—which leads to ungrammaticality: namely one that results from the logical constants of the sentence alone. In this sense the violation that can be observed might be argued to be “syntactic”: it can be read from the logical form of the sentences.

Thesis Supervisor: Danny Fox
Title: Professor of Linguistics

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Chapter 1

Weak Islands and Contradiction

1. Introduction

The central claim of this thesis is that weak islands are unacceptable because they lead to a contradiction. This can come about in one of two ways:

- i. The constraint that questions have a unique most informative answer is not met: therefore any complete answer is bound to state a contradiction.
- ii. The question presupposes a set of propositions that are contradictory.

In more intuitive terms we might say that it is a felicity condition on asking a question that the speaker might assume that the hearer is in a position to know *the complete answer*. But when there cannot be a maximal answer to a question, any potential complete answer amounts to the statement of a contradiction. Therefore, no hearer can be in the position to know the complete answer, and as a consequence the question cannot be asked. When the question presupposes a contradiction, it cannot be asked in any context.

1.1. The Maximal Informativeness Hypothesis

The first type of problem finds its antecedents in the proposals of Dayal (1996), Beck and Rullmann (1999), Fox and Hackl (2005). Dayal (1996) in particular has argued that a question presupposes that a member of its Karttunen-denotation entails all other members, in other words, that there is a single most informative true member among the

true alternative answers in the Hamblin-denotation. This condition is similar to the more familiar condition on the use of a definite description, which is only possible if the extension of the common noun that the definite article combines with has a maximal element. Fox and Hackl (2005) argue in turn that the maximality condition that Dayal (1996) proposes is never met in the case of negative degree questions. This for them follows from the hypothesis that the set of degrees relevant for the semantics of degree constructions is always dense (UDM). Given then that these questions can never have a most informative true answer, (i.e. they can never have a maximal true answer that entails all the other true answers) they will be unacceptable as a presupposition failure.

What I will adopt from the above proposals is that questions are unacceptable if they do not have a most informative answer, i.e. no true answer entails all the other true ones. I will call this condition of Dayal (1996)'s the *Maximal Informativeness Hypothesis*. If there is no maximal element in the Karttunen denotation of a question, then for any element in the Karttunen denotation, the assertion that it is the complete true answer will be a contradiction. I will use these two ways of stating the problem interchangeably.

1.2. Contradictory presuppositions

The second reason why weak islands might lead to a contradiction is that they might stand with a set of presuppositions that are incoherent. As no context can entail a contradictory set of presuppositions, potential complete answers to such questions will be doomed to be presupposition failures. Therefore, such questions will be judged as ungrammatical. Similar reasoning about contradictory presuppositions leading to ungrammaticality was proposed e.g. in Heim (1984), Krifka (1995), Zucchi (1995), Lahiri (1998), Guerzoni (2003), Abrusan (2007). In our case, the contradictory presuppositions arise because the relevant questions contain a presupposition trigger of a certain form: one that presupposes the truth of its complement. Given the observation that presuppositions embedded in questions project in a universal fashion, such questions will presuppose a set of propositions. In the case of weak island-sensitive extractees, I will argue, this set will necessarily be incoherent.

1.3. Extractees and interveners

I will further argue that the felicity condition on asking a question that there be a complete answer has the power to predict which elements will be bad extractees, as well as which contexts create weak island intervention in the following way:

- i. The contexts that constitute weak islands are those in the case of which we run into a contradiction with some but not other extractees.
- ii. The difference between the good and the bad extractees in the weak island creating environments is that in the case of bad extractees, the complete answer is always incoherent. This is not true however in the case of good extractees.

As will become evident in the course of the discussion, the above two conditions are but two sides of the same coin. The extractees that are sensitive to weak islands are special in that their domain is such that it contains atoms that are not independent of each other. As a consequence, the truth of an (atomic) proposition in the Hamblin-denotation has consequences for the truth of other atomic propositions in the Hamblin-denotation. This property however will, in some contexts, lead to a situation in which no complete answer can be found. These contexts are the contexts that create weak islands.

1.4 On contradiction

I have proposed above that the reason for the ungrammaticality of weak islands follows from the fact that all of their possible complete answers express a contradiction. But why does this fact lead to ungrammaticality? We are after all perfectly capable of expressing contradictory or nonsensical sentences, without them being ungrammatical: this was in fact the point behind Chomsky's famous example *Colorless green ideas sleep furiously*. However, it seems that we need to distinguish between contradiction that results from non-logical arguments, from a contradiction that results from the logical constants alone. Gajewski (2002) argues that the second in fact plays an important role for natural language: he argues that sentences that express a contradiction or tautology by virtue of their logical constants are ungrammatical. The present proposal falls under Gajewski

(2002)'s generalization in that it proposes that the weak island violations lead to a contradiction independently of the particular choice of variables.

1.5. Preview of this chapter

In the remainder of this chapter I will introduce the concepts discussed above in much greater detail. In Section 2 I discuss the semantics of questions about plural individuals, introducing Dayal (1996)'s *Maximal Informativeness Hypothesis* along the way. Section 3 spells out the assumptions about the nature of projection of presuppositional items embedded in questions. Section 4 discusses Gajewski (2002)'s condition about analytical sentences in further detail. Section 5 introduces the puzzle of weak islands in greater detail, listing the basic examples for easier further reference, as well as providing a preview of the chapters that will follow.

2 Questions about (plural) individuals

In this section I first briefly review the semantics of plurals and plural definite descriptions along with some concepts that will be useful later in this dissertation, and then turn to the explication of the semantics of positive and negative questions about plural individuals.

2.1 Plurals: An ordering and a designated element: the maximum

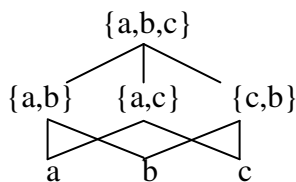
2.1.1 An ordering

Following the work of Link (1983) and many others it is commonly assumed that the domain of quantification over individuals is not simply a set of atomic individuals, but a set of individuals with a partial ordering: the domain of individuals is ordered by a part-of relation. Plural individuals are those that have other individuals as parts, singular individuals have only themselves as parts. A plural NP such as *John and Mary* denotes the plural individual that is the sum of the singular individuals *John* and *Mary*.

- (1) $\mathcal{D} = \wp^*(At)$, for some set At
 - i. For every set X , let $\wp(X)$ be the collection of all subsets of X
 - ii. $\wp^*(X) = \wp(X) \setminus \{\emptyset\}$
- (2) Singular individuals denote atoms, plural individuals denote sums of atoms
- (3) The proper part relation (\subseteq) and sum (\cup) are defined as usual
- (4) We will simplify assuming that $\{a\} = a$ (this is known as “Quine’s innovation”)¹

The structure that we thus arrive at is now a *free i-join semilattice*. These structures can be visualized as follows:

(5)



Where:

- i. $\{a, b\} \subseteq \{a, b, c\}$
- ii. $a \subseteq \{a, b\}$

2.1.2 Singular and plural NPs

How are singular and plural NPs represented in this structure? A singular NP denotes the set of *atomic individuals* that are in the extension of the NP. A plural NP can in principle be represented in two ways, and in fact both of these options have been proposed in the literature. We could say that plural common count nouns like *boys* are true of pluralities, i.e. non-singular sets of boys (this is e.g. the position assumed by Chierchia (1998)) Now, if, in a given model, the extension of the singular noun *boy* is $\{a, b, c\}$, then that of *boys* is $\{\{a,b\}, \{a,c\}, \{b,c\}, \{a,b,c\}\}$.

- (6) $\llbracket \text{boys} \rrbracket = \wp^* \llbracket \text{boy} \rrbracket \setminus At$

¹ cf. Schwarzschild (1996) e.g. on this point.

The second approach to plurals in this framework assumes that plural common count nouns like *boys* are true of pluralities and singularities. That is, if the extension of *boy* is $\{a, b, c\}$, then that of *boys* is $\{a, b, c, \{a,b\}, \{a,c\}, \{b,c\}, \{a,b,c\}\}$. (cf, Landman (1989) Landman (1991), Krifka (1989) and Schwarzschild (1996) Spector (2007)) In other words, *Boy* denotes a set of atoms, and *boys* denotes the i-join semilattice generated by $\llbracket \text{boy} \rrbracket$.

(7) $\llbracket \text{boys} \rrbracket = \wp^* \llbracket \text{boy} \rrbracket$

(8) the extension of the predicate is indicated by x-es below:



For the sake of concreteness, it is this second position that I will be assuming throughout this chapter; though as far as I can see it does not have any significant bearing on our issues.

2.1.3 The maximum

Above we have said that *boy* denotes a set of atoms, and *boys* denotes the i-join semilattice generated by $\llbracket \text{boy} \rrbracket$. It seems however that natural language also makes reference to a special element in this structure: the maximum. Sharvy (1980) proposes that *the boys* denotes precisely this special element: the maximal element of the set of all boys. The iota operator can be used to interpret the definite article: when it applies to the extension of a plural noun like *boys*, it refers to the largest plurality in that extension.

(9) $\llbracket \iota x. P(x) \rrbracket = \cup \llbracket P \rrbracket$ if $\cup \llbracket P \rrbracket \in \llbracket P \rrbracket$; undefined otherwise

i.e. $\iota x. P(x)$ is only defined if $\llbracket P \rrbracket$ forms itself an i-join semilattice, and

then $\iota x. P(x)$ is the maximal element of $\llbracket P \rrbracket$.

(10) $\llbracket \text{the boys} \rrbracket = \iota x [x \in \llbracket \text{boys} \rrbracket]$

When the iota operator applies to a set of singularities there are two things that can happen: if a singular predicate has more than one object in its extension, the maximum will not be defined. If, on the other hand, the singular predicate has only one element in its extension, the iota operator picks out this object. This is how the singularity presupposition of the definite determiner is accounted for.

2.1.4 Distributivity

In the framework introduced above, singular and plural individuals are treated in the same way: There is no ontological difference between denotations of singular terms like *the boy* and a plural term like *the boys*. The reason for this is that Link (1983) wanted to provide an analysis to collective and distributive readings of plurals, but keeping a common representation for definite plurals. The solution was to assign them groups as denotation. (Following Schwarzschild (1996), among others, I have been representing groups as sets). Now, if e.g. the sum of John and Bill is an individual on its own right, this plural individual can be in the extension of a predicate like *meet*, without it being the case that the individuals making up the plural individual would be necessarily in the extension of the predicate as well. Thus, it does not follow from the truth of *Bill and John met* that *#Bill met* or that *#John met*. Similarly, a sentence such as *The lamp and the box are heavy* might be true in a context, even if neither the lamp nor the box themselves are heavy.

The question that arises though is how can we deal with distributive predicates, i.e. predicates that seem to be true of the individuals that make up the plurality in question, e.g. *blond* or *intelligent*. The solution of Link (1983) is to apply a distributive operator to a predicate:

(11) $\text{Dist } (P)(x)=1$ iff $P(x)=1$ or $\forall y [y \in x \rightarrow P(y)=1]$

Now, even though a predicate such as *intelligent* might be undefined for a plurality, it can still be true for a plurality under a distributive operator:

- (12) a. $\llbracket \text{intelligent} \rrbracket (\{\text{Bill}, \text{Mary}\})$ is undefined
b. $\llbracket \text{intelligent} \rrbracket (\{\text{Bill}\}) = 1$; $\llbracket \text{intelligent} \rrbracket (\{\text{Mary}\}) = 1$
c. $\text{Dist } (\llbracket \text{intelligent} \rrbracket) (\{\text{Bill}, \text{Mary}\}) = 1$

2.1.5 Homogeneity

It has been noted since Fodor (1970) that definite plurals give rise to “all or nothing” effects: e.g. an utterance such as *I didn't see the boys* gives rise to an inference that I did not see *any* of the boys. This is shown e.g. by the oddness of continuations such as below. Notice the contrast with the universal quantifier:

(13) I didn't see the boys. #But I did see some of them

(14) I didn't see all the boys. But I did see some of them.

(15) Are the boys we met orphans? #No, some of them are.

(16) Are all the boys we met orphans? No, some of them are.

Fodor (1970) therefore proposes that definite plurals trigger an all or none presupposition. Löbner (1985, (2000) extends this view to propose that the all-or-none presupposition is a presupposition that holds of all predications, including examples such as *John painted the table*, where we seem to infer that John painted the whole table:

(17) *Presupposition of Indivisibility* :

Whenever a predicate is applied to one of its arguments, it is true or false of the argument as a whole.

Löbner, in effect, incorporates this presupposition (a.k.a. the Homogeneity presupposition) into the meaning of the distributive operator:

$$(18) \quad \text{Dist}(P) = \lambda x: [\forall y \in x \ P(y)] \text{ or } [\forall y \in x \ \neg P(y)]. \quad \forall y \in x \ P(y)$$

Given this new distributive operator, a sentence such as *I didn't see the boys* interpreted distributively will presuppose that I either saw all the boys or I did not see any of them, and it will assert that it is false that I saw each of the boys. The combination of the presupposition and the assertion results in the inference that I did not see any of the boys. In other words, via the homogeneity presupposition, $\neg(A \wedge B)$ is strengthened into $(\neg A \wedge \neg B)$. Since Löbner (1985) the homogeneity presupposition is widely assumed to be an important aspect of the distributivity operator, cf. e.g. the work of Schwarzschild (1994), Beck (2001), Gajewski (2005), among others.

2.2. Questions about (Plural) Individuals

We have seen above that the domain of individuals is commonly assumed to be a partially ordered set. Expressions in natural language such as singular and plural common nouns, and definite noun phrases denote different elements/parts of this structure. Now I will turn to denotations of questions about individuals, and show that there is a sense in which we can think of the denotation of questions as denoting an ordered set.

2.2.1 Hamblin and plurals: an ordering

According to Hamblin (1973) questions denote sets of propositions, namely the set of possible answers. A question about individuals such as (19)a has the denotation as in (19)b, informally represented in (19)c:

- (19) a. Which man came?
 b. $\lambda p \exists x [\text{man}(x)(w) \wedge p = \lambda w'. \text{came}(w')(x)]$
 c. {that John came, that Bill came, that Fred came..}

The above example is singular. However we could also allow the wh-word to range over both singular and plural individuals, as shown in (20):

- (20) a. Which men came?
 b. $\lambda p \exists x [\text{man}^*(x)(w) \wedge p = \lambda w'. \text{came}(w')(x)]$
 c. {that John came, that Bill came, that Fred came, that John & Bill came, that John & Fred came... etc}

Recall now that in a system like that of Link (1983) a plural individual is an individual on its own right. Therefore the question alternatives denote distinct propositions, and are not ordered by entailment. (This can be easily seen e.g. in the case if the predicate was collective.) Still, if the predicates that apply to the plural individuals are interpreted distributively, we get an ordering of the propositions (by entailment) in the Hamblin denotation: this is because *John and Bill came*, understood distributively, means that John came and Bill came. Therefore a proposition such as John & Bill came_D (where the subscript _D signals that the predicate is to be understood distributively) entails the propositions that John came, and that Bill came. Because of distributivity then, the propositions in the Hamblin set of (20) are ordered by set inclusion. This will give us the same structure for the propositions in the question's Hamblin-denotation that we saw above for the individuals: a free join semilattice.

2.2.2 Karttunen

We can also define sub-lattices in our ordered Hamblin denotation. E.g. we could define the set of true answers: This gives us Karttunen (1977)'s question denotation. Karttunen (1977) has observed that (21)b entails that for every man who came, John knows that they came. If the question denotes the set of true propositions, this inference follows as a consequence from the question denotation itself.

- (21) a. Which men came?
 b. John knows which man came
 c. $\llbracket \text{which man came} \rrbracket = \lambda p \exists x [(p(w) \wedge \text{man}(w)(x) \wedge p = \lambda w'. \text{came}(w')(x)]$

While the above meaning has been famously shown to be too weak in the complement of *know* by Groenendijk and Stokhof (1984), Heim (1994) and Beck and Rullmann (1999) defend it for certain other predicates (e.g. *surprise*, *predict*).

2.2.3 The maximal answer: Dayal (1996), Jacobson (1995)

Given the sub-lattice of true answers to a question about plural individuals, we can define the maximal element among these true propositions. Dayal (1996) and Jacobson (1995) have proposed exactly this. More precisely, Dayal (1996) has proposed to distinguish a question (which is a set of possible answers) from the Answer, which is the maximal true proposition. The answer operator (Ans) in Dayal (1996)'s system has a very similar function to a definite determiner; it picks the maximum of the true answers under entailment:²

$$(22) \quad \text{Ans}(Q) = \uparrow \{p \in Q \wedge p(w)\}$$

Since the Answer operator outputs a single proposition, this view of question-meaning is compatible with the proposal of Groenendijk and Stokhof (1984) according to which questions denote propositions, instead of sets of propositions.

What we have seen in the previous sections is that given a partially ordered set of potential answers to a question about (singular and plural) individuals (=the Hamblin (1973) denotation of the question) we can define a sub-lattice of the true answers (=the Karttunen (1977) denotation of the question) and take the maximum of this set (=the most informative true answer by Dayal (1996) and Jacobson (1995)). This view of question meanings follows the footsteps of Heim (1994) and Beck and Rullmann (1999) in assuming that natural language allows a certain flexibility as to which parts of the Hamblin-structure are used in various contexts.

² Jacobson (1995) proposes that questions do not have to denote sets of propositions, rather, the embedded question can denote the unique proposition such that there exists some entity X such that p is true and the denotation of the wh-constituent is true of X:

(1) a. WH \rightarrow Q

2.2.4 The complete answer

Groenendijk and Stokhof (1984) have famously argued that Karttunen (1977)'s semantics for questions makes too weak predictions in embedded contexts. The Karttunen denotation of a question is the collection of all the true answers. [Alternatively a maximal answer in the sense of Dayal (1996), Jacobson (1995) is the unique answer that is true and entails all the other true answers]. The question meaning that Groenendijk and Stokhof (1984) have argued for is a strengthened version of a maximal answer: It stands with the inference that the alternatives that are not entailed are false.

◆ Maximal answer (*≈the*)

(equivalent to a *weakly* exhaustive answer, or *Ans1* of Heim (1994))

$$(23) \quad \text{Ans}(Q)(w) = \uparrow p [p \in Q \wedge p(w)]$$

◆ Complete answer (*≈only*)

(equivalent to a *strongly* exhaustive answer, or *Ans2* of Heim (1994))

$$(24) \quad \text{Exh}(Q)(w) = \uparrow p [p(w) \& \forall p' \in Q [p \not\subseteq p' \rightarrow \neg p'(w)]]$$

In the case of matrix questions, when we assert a maximal answer, it is strengthened into a complete answer. For the sake of concreteness, I will assume here (extending Fox (2006)) that this strengthening is done by an operator in the syntax (although I believe whether it is done in the syntax or in the semantics is ultimately immaterial to the present proposal). [However, following Heim (1994) and Beck and Rullmann (1999) I will assume that certain verbs that embed questions can select for the first type of answer lexically.]

2.2.5 An example: positive and negative questions about individuals

Let's look at examples of a positive and a negative question about (plural) individuals. The first example is that of a positive question about plural individuals. The Hamblin-denotation of the question in (25) is the set of alternative propositions that might be the answers to the question.

b. $Q' = \uparrow p [\exists X(p(w) \wedge p = \text{WH}(w)(X))]$

- (25) a. Who/Which men came?
 b. $\lambda p \exists x [\text{man}^*(w)(x) \wedge p = \lambda w'. \text{came}(w')(x)]$
 c. {John came, Bill came, John+Bill came, Roger came...}

The set of possible answers contains propositions about both singular and plural individuals. If the predicate is understood distributively, the alternatives will be partially ordered. If e.g. it is the case that John and Bill came, the maximal true answer is the proposition that John+Bill came, and the propositions that John came and that Bill came are entailed by it.

Since it will be important for the chapter on negative islands, let's look at an example of a negative question about plural individuals in some detail as well:

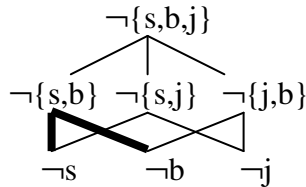
- (26) ||Who did you not invite?||
 $= \lambda p \exists x [\text{man}^*(w)(x) \wedge p = \lambda w'. \text{you did not invite}(w')(x)]$
 $= \{\text{that you did not invite Bill; that you did not invite Bill+Sue; that you did not invite Mary +Sue; etc.}\}$

Notice that in this case the alternatives can contain both plural and singular individuals. What kind of entailment relationships exist among these propositions? Recall that predication over plurals seems to give rise to “all-or-nothing” effects: *John did not invite the girls* has the reading that he invited none of the girls, and, importantly, lacks the reading that he invited some but not all the girls. As we have above, this pattern is standardly derived by equipping the distributivity operator with a homogeneity presupposition. (cf. e.g. Löbner (1985), Schwarzschild (1993), Beck (2001), Gajewski (2005)) Because of the homogeneity presupposition then, a negative proposition that predicates over a plural individual X in the answer set in (26) will entail all the negative propositions over the singularities $x \in X$. E.g. the proposition that you did not invite Bill+Sue will entail that you did not invite Bill and that you did not invite Sue.

Suppose now that our domain includes three individuals: Bill, Sue and John, and we indeed select *that you did not invite Bill+Sue* as our most informative true answer to

(26). Now we know that no other proposition in the Hamblin set is true. Let's represent the Hamblin set with the following diagram:

(27)



Since we know that the proposition that you did not invite John is not true in w , and we know that John exists in w and is part of our relevant domain, we will infer that indeed you did invite John. Similarly, take the proposition that you did not invite Sue and John. By the homogeneity presupposition, this will entail that you invited neither of Sue or John—which we now know to be not true in the world. But we also know that you indeed did not invite Sue, therefore this conjunction can only be false if you did in fact invite John. This is how we derive the positive inference of a complete answer to a negative question, namely the inference that other than Sue and Bill, you invited everyone in a given domain.

2.3. The Maximal Informativeness Hypothesis

Let's now turn to the following example discussed by Dayal (1996):

- (28) a. Which man came?
 b. $\lambda p \exists x [\text{man}(x)(w) \wedge p = \lambda w'. \text{came}(x) \text{ in } w']$
 c. {John came, Bill came, Peter came...}

In the above example *which man* is a singular noun phrase, and therefore it restricts the domain of quantification to atomic men. Therefore the question in (28) denotes a set of atomic propositions. Of course, in principle many of these alternative propositions could be true. However, the answer operator is looking for a maximally true proposition in this set. If there are more true singular propositions, their maximum is not defined and therefore the answer operator will not be defined either. The answer operator will only

give an answer if the set of possible answers only contains one true answer: this will be at the same time the maximal true answer. This is how Dayal (1996) derives the uniqueness presupposition on individuals with singular Wh-words.

Thus we have seen a nice example of the *Maximal Informativeness Hypothesis* at work. Another approach that uses this condition is Fox and Hackl (2005), which will be reviewed in the next chapter. The present proposal follows this trait inasmuch as it claims that the oddness of certain weak islands is to be explained as an instance of violating the presupposition that there be a maximally informative answer. I will argue that in the case of extractees that create weak islands there will always be at least two alternatives among the set of alternatives that need to be ruled out given the strong exhaustive reading of the answer, yet cannot be ruled out at the same time.

3 On contradictory presuppositions

As I have stated in the introduction of the present chapter, the reason why there can be no complete answer to a question containing certain presuppositional items is that any potential complete answer will carry a set of presuppositions that are incoherent. As no context can entail a contradictory set of presuppositions, potential complete answers to such questions will not be assertable in any context. Therefore, such questions will be judged as ungrammatical. (For other approaches that proposed that contradictory presuppositions leading to ungrammaticality cf. Heim (1984), Krifka (1995), Zucchi (1995), Lahiri (1998), Guerzoni (2003), Abels (2004), Abrusan (2007))

3.1 Presuppositions embedded in questions project universally

Heim (1983) and more recently Schlenker (2006a) and Schlenker (2007) have argued that quantified sentences trigger a universal presupposition (29).³ In the case of a quantifier such as *no one*, e.g. this prediction indeed seems to be borne out: (30):

- (29) Quantified sentence: $[Q:R(x)]S_p(x)$
presupposition: $[\forall x: R(x)] p(x)$

³ But cf. Beaver (1994) for different view on the projection of presuppositions from quantified sentences, as well as Chemla (2007) for a discussion of empirical differences among various quantifiers.

- (30) None of these ten people knows that his mother is a spy
presupposition: all of these 10 people's mother is a spy

As questions are quantificational structures, this approach predicts that presuppositions should project from questions in a universal fashion as well. It seems that indeed this prediction is indeed born out: the following examples show that the projection behavior of presuppositional items is universal:

- (31) Which of his three wives has John stopped beating?

Inference: John was beating all of his three wives

- (32) Which of your three friends went to Paris again?

Inference: all three of your friends went to Paris before

- (33) Which of these ten boys does Mary regret that Bill invited?

Inference: Mary believes that Bill invited each of these ten boys

Based on such examples I will assume that we should follow Heim (1992) in assuming that presuppositions project out of questions in a universal fashion in general. (For a recent discussion of presupposition projection from questions see also Guerzoni (2003), who builds on Heim (2001).)

3.2. Contradictory presuppositions and complete answers

Can we connect the problem of incoherent presuppositions of questions to the impossibility of having a complete answer? In this section I will suggest that the generalization that complete answers are contradictory in the case of weak islands in fact can be thought of as subsuming also the cases where the contradiction arises out of incoherent presuppositions.

Recall that we have been operating with two distinct but related notions as regarding the notion of answers: maximal answer and complete answer. A maximal

answer is the unique answer that is true and entails all the other true answers (Dayal (1996), Jacobson (1995)). A complete answer is a strengthened version of a maximal answer: it asserts that the alternatives that are not entailed are false. How do presuppositions project out of a complete answer?

Let's take a look first at the following sentence:

- (34) (Among John, Bill and Mary) Only John knows that his mother is a spy
- a. 'John's mother is known to be a spy only by John'
 - b. 'John is the only one such that x's mother is known to be a spy by x'

The example in (34)b suggests that *only* patterns with generalized quantifiers in its projection behavior: the sentence in (34) indeed seems to give rise to the inference that everyone's mother is a spy.

- (35) *Inference of (34)* : everyone's mother is a spy

I will assume therefore that quite generally presuppositions in the scope of *only* project in a universal fashion:

- (36) Only (Alt) (p) = $\lambda w: p(w)=1. \forall p' \in \text{Alt} [p \not\subseteq p' \rightarrow p'(w)=0]$

- (37) Only (Alt) (p_{pres})(w)

Projected Presupposition: $\forall q \in \text{Alt}: \text{pres}(w)=1$

Given that the exhaustive operator that we have been assuming is for all intents and purposes equivalent to *only* (modulo the fact that it asserts, rather than presupposes the truth of the prejacent), it is reasonable to assume that it will behave in a similar fashion to *only* with respect to presupposition projection (38). Indeed, this prediction seems to be confirmed by our intuition about a sentence such as the one in (31):

- (38) Exh (Q) (p_{pr}) (w)

Presupposition: $\forall q \in \text{Alt}: \text{pr}(w)=1$

A complete answer to a question including a presuppositional item will therefore come with a set of presuppositions: the presuppositions of all the propositional alternatives.

3.3 A set of contradictory presuppositions

However, as I will show this set of presuppositions turns out to be contradictory in the case of manner and degree questions. A set of contradictory presuppositions has the unpleasant consequence that the sentence is unassertable in any context: this is because there is no context in which all the presuppositions can be satisfied. Why will this set be contradictory? The problem is that there will always be (at least) two alternatives that are mutually incompatible, and yet will both have to be part of the set of presuppositions of a complete answer. But since no context can entail two mutually exclusive propositions, there will never be a context in which an answer to manner or degree questions containing the above mentioned presuppositional items can be asserted. In the case of questions about individuals however the (atomic) alternatives are independent from each other and hence no problem will arise.

4 Contradiction and grammaticality

I have proposed above that the reason for the ungrammaticality of weak islands should follow from the fact that all of their possible complete answers express a contradiction. But why exactly does this fact lead to ungrammaticality? We are, after all, perfectly capable of expressing contradictions that are not ungrammatical, cf. the example below:

(39) The table is red and not red.

What is the difference between the two types of contradiction and why does one, but not the other lead to ungrammaticality? This section addresses this concern.

The earliest examples of analyses that resort to analyticity were proposed by Dowty (1979) and Barwise and Cooper (1981). Dowty (1979) argued that combining accomplishment verbs with durative adverbials leads to a contradiction and that this contradiction is the source of unacceptability, while Barwise and Cooper (1981) proposed

that an explanation of the ungrammaticality of strong quantifiers in existential *there*-constructions follows from the fact that these would express a tautology. Later examples of such reasoning include Chierchia (1984), von Stechow (1993)'s analysis of the ungrammaticality of exceptives with non-universal quantifiers and Fox and Hackl (2005). (cf. also Ladusaw (1986) and Gajewski (2002) for an overview). How can these proposals be reconciled with the fact that natural language is capable to express tautologies and contradictions, otherwise?

Gajewski (2002) argues that we need to distinguish between analyticity that results from the logical constants alone, from analyticity that is the result of the non-logical vocabulary. He argues that it is the former that plays an important role for natural language: he argues that sentences that express a contradiction or tautology by virtue of their logical constants are ungrammatical. He follows van Benthem (1989) and others in defining logical constants as those notions that are permutation invariant.⁴ Thus linguistic representations that have the same semantic value under any permutation of the domain are ungrammatical. More precisely Gajewski (2002) proposes to distinguish two types of analytic sentences: (ordinary) analytic sentences and L(ogical)-analytic sentences. While (ordinary) analytic sentences are true in every model, L-analytic sentences are true in every model with every possible combination of non-logical arguments. In other words, L-analytic sentences are not only true in every model, but remain true under rewriting of their non-logical parts. Gajewski (2002) further proposes that the kind of analyticity that induces ungrammaticality in natural language is L-analyticity.

(40) DEFINITION. An LF constituent α of type t is *L-analytic* iff α 's logical skeleton receives the denotation 1 (or 0) under every variable assignment.

(41) A sentence is ungrammatical if its Logical Form contains an L-analytic constituent

⁴ This way of defining what counts as a logical constant and what is part of the non-logical vocabulary might turn out to be too ambitious: e.g. predicates such as (*self*-)identical might turn out to be part of the non-logical vocabulary, while being permutation invariant at the same time. It is possible therefore that we

Gajewski (2002) shows that (41) can correctly distinguish sentences like (39) from well-known examples of ungrammatical analytic sentences, such as tautologies proposed in Barwise and Cooper (1981)'s explanation of the ungrammaticality of strong quantifiers in existential *there*-constructions and contradictions in von Stechow (1993)'s analysis of the ungrammaticality of exceptives with non-universal quantifiers.

I will adopt Gajewski (2002)'s proposal that it is L-analyticity that leads to ungrammaticality. What will have to be shown then is that complete answers to weak islands are L-analytical. In other words, what we are looking for is to show that a complete answer to weak islands remain ungrammatical under any variable assignment. As we will see, this is indeed the case.

5 Extractees and interveners

5.1 The facts

Let's include here a list of the extractees that are sensitive to weak islands, as well as a list of contexts that constitute weak islands for easier future reference. (cf. Szabolcsi (2006) e.g. for a more detailed overview):

□ Extractees that are sensitive to weak islands

The main examples of extractees that are sensitive to weak island contexts are the following:

Questions about manners

(42) *How did John regret that he behaved at the party?

Questions about degrees

(43) *How many children doesn't John have?

Questions involving when, where--in some cases

- (44) a. *Where aren't you now?
b. Where haven't you looked for the keys?

should be content with a less ambitious proposal, in which logical constants are simply stipulated as being such, as in any logical system. (thanks to D. Fox for pointing this issue out to me)

Questions about individuals with one-time only predicates

(45) *Who has't destroyed Rome?

Split constructions

(46) *Combien as-tu beaucoup/souvent/peu/rarement consulté de livres? [*French*]

how many have you a lot/often/a little/ rarely consulted of books

'How many books have you consulted a lot/often/a little/ rarely ?

(47) *Wat heb je veel/twee keer voor boeken gelezen? [*Dutch*]

what have you a lot/twice for books read?

'What kind of books have you read a lot/twice?'

examples (46)-(47) from de Swart (1992)

□ **Contexts that create weak islands**

i. Negative Islands

(48) a. Who did Bill not invite to the party?

b. *How many children doesn't John have?

ii. Presuppositional Islands

Factive verbs:

(49) a. Who did John regret that he invited to the party?

b. *How did John regret that he behaved at the party?

Response stance verbs

(50) a. Who did John deny that he invited to the party?

b. *How much wine has John denied that he spilled at the party?

Extraposition:

(51) a. Who was it scandalous that John invited to the party?

b. *How was it scandalous that John behaved at the party?

Adverbs of quantification:

- (52) a. Who did you invite a lot?
b. *How did you behave a lot?

Only NP:

- (53) a. Who did only John invite to the party?
b. ??How did only John behave at the party?

iii. Weak Islands created by certain quantifiers

- (54) a. Who did few girls invite to the party?
b. ???How did few/less than 3 girls behave at the party?
c. How did at most 3 girls behave at the party?

iv. Weak Islands created by (tenseless) Wh-Islands

- (55) a. Which man are you wondering whether to invite _?
b. *How are you wondering whether to behave _?
c. *How many books are they wondering whether to write next year _?

5.2 The proposal in a nutshell

In the next chapters of this dissertation I will show that the domain of weak island inducers is special in that it leads to the following problems:

- i. In the case of Negative islands, Quantificational interveners, Tenseless *whether*-islands: the statement for any proposition that it is the complete answer is a contradiction.
- ii. In the case of presuppositional islands: the set of presuppositions that the question stands with always contains at least two mutually incompatible propositions.

5.3 Preview of the following chapters

Chapter 2 contains an overview of the previous literature on this subject. Chapter 3 examines negative islands. I first discuss negative islands with manners, and propose that

the reason why a complete answer is not possible in these cases is that the domain of manners always contains contraries. Second, I look at negative islands created by degree constructions, and argue that these facts can be captured by an interval-based approach to the semantics of degree constructions. After that, I will briefly look at other island-sensitive extractees such as *when* and *where* and show that a similar approach to the one presented for manner and degree questions can be extended to them as well. Building on the results of the chapter on negative islands, Chapter 4 examines islands created by presuppositional items in detail. I propose that an approach based on contrary manners/an interval semantics of degrees can be extended in a straightforward fashion to explain the oddness of these as well. In Chapter 5 I show how the present approach can account for *wh*-islands. Finally in Chapter 6 I look at islands created by quantificational interveners.

Chapter 2

Previous proposals

1. Introduction

This chapter is tribute to the predecessors, as well as an explanation as for why the search for new explanations is still necessary. In my brief review of the previous proposals, I will depart slightly from chronological order and group the various proposals according to the similarity in the content of their proposals. It should be also borne in mind that the different proposals often focus on a somewhat different range of facts. The discussion here will be rather succinct, for a more detailed overview of most of the accounts discussed below cf. Szabolcsi (2006) and den Dikken and Szabolcsi (2002).

2. Syntactic proposals: Rizzi (1990), Cinque (1990)

The basic idea behind all syntactic accounts of weak islands is the following: the contexts that create weak islands are roadblocks for movement. However, items that possess a special permit might still be able to go through. The points in (1) to (3) spell out how Rizzi (1990) implements this idea. The main insight in Rizzi (1990) (which builds on Obenauer (1984)) however is not so much the technical implementation of the above idea, rather, an understanding of what constitutes roadblocks: roadblocks are items that are sufficiently similar to the moved item. This is in fact the central idea of ‘Relativised minimality’.

- (1)
 - i. Referential A-bar phrases have indices (where “referential” is to be understood as having a “referential” theta-role)
 - ii. Non-referential A-bar phrases do not have indices

- (2)
 - i. Binding requires identity of referential indices
 - ii. Referential A-bar, but not non-referential A-bar phrases can be connected to their trace by binding

- (3)
 - i. Non-referential A-bar phrases need to be connected to their traces by antecedent governed chain.
 - ii. An antecedent-chain is broken by intervening A-bar specifiers, or if the clause from which the non-referential A-bar phrase is extracted is not properly head governed by a verbal head

In other words, an antecedent chain is highly sensitive to intervention. However, referential A-bar phrases have a special property (the index) which allows them to resort to binding, instead of antecedent-government, to connect to their trace. Binding is an arbitrarily long-distance relation that is not subject to interveners, therefore referential A-bar phrases will not be subject to the same locality conditions as the non-referential A-bar phrases. The idea of “Relativised Minimality” is manifested above by the fact that A-bar specifiers are interveners for the movement of the like A-bar phrases. Let’s look at an example:

- (4) *How are you wondering whether to behave?
- (5) ?Which man are you wondering whether to invite?

The reason why (4) is unacceptable in Rizzi (1990)’s system is that the *wh*-adverb (an A-bar phrase) needs to be connected to its trace via an antecedent government chain. However the complementiser *whether* is in an A-bar position (the spec of CP) therefore it will intervene for the movement of another A-bar element. The *wh*-word in (5) however is referential, and therefore it can connect to its trace via binding.

Cinque (1990) (drawing on Comorovski (1989) and Kroch (1989)) adds to the above theory that referential items need to be also D-linked in the sense of Pesetsky (1987) to be able to connect to their trace via binding. He motivates this by the observation that *wh*-phrases such as *how many dollars* or *who-the-hell*⁵ seem to be sensitive to weak islands, despite the fact that they receive a referential theta-role according to Rizzi (1990)'s theory:

- (6) a. *How many dollars did you regret that I have spent?
- b. *Who the hell are you wondering whether to invite?

The basic idea of Rizzi (1990) and Cinque (1990) have been implemented since then in various different forms, most importantly in the form of the *Minimal Link Condition* of Chomsky (1995) and its revision in Manzini (1998); and in a feature-based format in Starke (2001)'s theory of locality.

The main problems for these syntactic accounts that have been pointed out in the literature (most importantly Szabolcsi and Zwarts (1993), Honcoop (1998), Rullmann (1995), Szabolcsi (2006)) are the following:

- i. It is unclear why certain quantifiers, but not others should occupy an A-bar position.
- ii. It is not clear that there is a syntactic difference between factive and response stance verbs on the one hand, and other attitude verbs on the other hand.

⁵ As for *wh-the hell* expressions, I will (partly) follow Szabolcsi and Zwarts (1993) who point out that D-linking does not seem to be the minimal difference between *wh-the-hell* expressions and their plain counterpart. As for a felicitous use of an *wh-the-hell* expression, they cite the following example (attributed to Bruce Hayes): "If we know that whenever someone sees his mother, God sends purple rain, then upon seeing purple rain, I can ask: *Who the hell saw his mother?*" Szabolcsi and Zwarts (1993) argue that the example shows that the use of *wh-the-hell* expression requires unquestionable evidence that someone saw his mother. I believe, however, that what the example shows is rather the property of *wh-the-hell* expressions noted in den Dikken and Giannakidou (2002) that they induce obligatory domain-widening. In the example above, the salient domain of individuals is everyone in the world. Once we have such a wide domain in mind, some of the weak-island examples improve as well: e.g. if we change the above scenario a bit, such that God sends purple rain whenever someone does *not* call his mother on her birthday, then, upon seeing purple rain, the following negative question becomes perfectly acceptable: *Who-the-hell didn't call his mother?* As for *how-many* phrases, I will follow Rullmann (1995) who argues that the difference in the acceptability of such examples is that of scope, rather than D-linking.

- iii. Negation can be cross-linguistically expressed as a head or a specifier or an adjunct, yet the island-creating behavior of negation does not vary cross-linguistically.
- iv. The theory claims to be syntactic, yet the characterization of the good vs. bad extractees seems to be semantic in nature. This calls for further explanation.

To the above list of well-known complaints we might add the following problem, which in fact is probably the most troubling:

- v. Fox and Hackl (2005) have argued that certain quantifiers can rescue negative islands: more precisely, universal modals above negation or existential modals under negation save negative degree questions:

- (7) a. How much radiation are we not allowed to expose our workers to?
- b. How much are you sure that this vessel won't weigh?

It is highly unlikely that a syntactic account could be extended to explain these facts: if negation is an A-bar intervener, the addition of a modal should not be able to change this fact.

3. General Semantic Accounts: Szabolcsi and Zwarts (1993), and its extensions in Honcoop (1998)

The very first paper to propose that the weak island intervention facts should follow from semantic properties was Szabolcsi and Zwarts (1990). This first theory was then substantially revised in Szabolcsi and Zwarts (1993). The revisions were mainly motivated by a paper by de Swart that has appeared in the meantime (de Swart (1992)). The important contribution of de Swart (1992) was that it challenged the prevailing view that it is only DE operators that create intervention. She argued, based on split constructions, that in fact all scopal elements cause intervention. The real difference between DE and UE quantifiers is that for independent reasons, a wide scope (pair-list) reading is not available for DE quantifiers in questions (cf. Groenendijk and Stokhof

(1984)). Thus, while the question below is grammatical, importantly it does not have the reading in (8)b:

- (8) How many pounds does every boy weigh?
- (a) 'For every boy x, how many pounds does x weigh?'
 - (b) '#For what n, every boy weighs at least n?'
 - (c) 'What is the unique degree such that every boy weighs (exactly) that much?'

Downward entailing quantifiers on the other hand do not have the possibility for the wide scope (pair-list) reading, therefore they appear ungrammatical. Szabolcsi and Zwarts (1993) point out however that the proposal in de Swart (1992) according to which scopal items thus always create intervention seems to be too strong: they argue that e.g. indefinites and (non-factive) attitude verbs do not seem to cause intervention⁶:

- (9) ?How did a boy behave?
- (10) How do you want me to behave?

3.1 An algebraic semantic account: Szabolcsi and Zwarts (1993)

Szabolcsi and Zwarts (1993) (reprinted with minor modifications in Szabolcsi (1997)) attempt therefore at drawing a principled demarcation line between the scopal expressions that create intervention, and those that do not. Their explanation, based on algebraic semantics, proceeds in the following steps, as summarized in (11) to(13)⁷. The first step in their proposal is the following:

- (11) Each scopal element is associated with certain Boolean operations.

This claim should be understood that each scopal element in conjunction with a distributive verbal predicate can be interpreted as a Boolean combination of singular predications (assuming that the domain of students is given):

⁶ As regards indefinites however the facts are not that clear: cf. discussion in Honcoop (1998) and in Chapter 5 of this thesis.

⁷ This presentation draws also on Honcoop (1998)'s explication of Szabolcsi and Zwarts (1993)'s theory.

- i. John walked $=W(j)$
- ii. John did not walk $=\neg(W(j))$
- iii. No student walked $=\neg(W(j)\vee W(b)\vee W(m))$
- iv. Less than two students walked
 $=\neg((W(j)\wedge W(b))\vee(W(j)\wedge W(m))\vee(W(m)\wedge W(b)))$
- v. Every student walked $=W(j)\wedge W(b)\wedge W(m)$
- vi. A student walked $=W(j)\vee W(b)\vee W(m)$

These observations can be generalized in the following way:

- i. Negation corresponds to taking Boolean *complement*
- ii. Universal quantification corresponds to taking Boolean *meet*
- iii. Existential quantification corresponds to taking Boolean *join*
- iv. Numerical quantification corresponds to a combination of at least Boolean *meet* and *join* (and, in the case of DE operators, complement)

The second step in the proposal can be stated as follows:

- (12) For a *wh*-phrase to take scope over a scopal element means that the operations associated with the scopal element need to be performed in the *wh*-phrase's denotation domain.

This means the following. To answer the question in (i) below, we need to construct the set of people that John likes: (the set of individuals is indicated by :=; L stands for *likes*')

- i. Who does John like? $:=\{a: \langle j,a \rangle \in \llbracket L \rrbracket\}$

To answer the question in (ii) below, we need to construct the set of people that John likes, and then take its complement (where D stands for the domain of discourse):

ii. Who doesn't John like? $:=D \setminus \{a: \langle j,a \rangle \in \llbracket L \rrbracket\}$

To answer the question in (iii) on the non-pair list reading, we construct for each student s the set of people liked by s , and then intersect these sets:

iii. Who does every student like?
 $=\cap \{ \{a: \langle j,a \rangle \in \llbracket L \rrbracket\}, \{a: \langle b,a \rangle \in \llbracket L \rrbracket\}, \{a: \langle m,a \rangle \in \llbracket L \rrbracket\} \}$

And so on. The last piece of the explanation is the following:

(13) If the *wh*-phrase denotes in a domain for which the requisite operation is not defined, it cannot scope over SE.

In the examples above, the *wh*-ranges over individuals. In other words, in this theory sets of individuals serve as denotations for predicates, if the argument slot abstracted over is filled by an atomic individual. Individuals can be collected to unordered sets. All Boolean operations can be performed on sets of individuals, because the power set of any set of individuals forms a Boolean algebra. E.g. complementation can be performed on sets of individuals, and therefore negative questions about individuals are grammatical. Manner predicates however are argued to be collective and therefore they do not have a component $\{\alpha: j \text{ behaved in } \alpha\}$. Instead, they have what one might write as $\iota \alpha [j \text{ behaved in } \alpha]$, and the question asks which (collective) manner is identical to this unique individual (sum). This is why manner questions are bad: one cannot complement an i-sum. Similarly the operation meet cannot be performed on these structures, therefore the *wh*-elements that denote in these partially ordered domains will not be able to scope over the scopal elements that correspond to these operations. As e.g. universal quantification corresponds to meet, but existential quantification corresponds to join, universal but not existential quantifiers are predicted to be interveners. The bad extractees then are those

which range over a domain that has a partial ordering defined on it, while the good extractees range over a domain of individuals.

Szabolcsi and Zwarts (1993)'s account is based on the very interesting idea that the difference between the good and the bad extractees is to be found in the properties of their domain. This idea, albeit in a completely different form, is also shared by the account that is developed in this thesis, as well as by Fox and Hackl (2005), in yet another way. Further, as far as the analysis of negative islands is concerned, both the account advanced in this thesis (as well as that of Fox&Hackl for negative degree questions) relies on the idea that negative islands result from the fact complementation is not defined for some or other reason for the domain of manners and degrees. However, the account in Szabolcsi and Zwarts (1993) faces certain serious problems:

- i. As the authors themselves point out, their account is rather programmatic as far as presuppositional interveners and tenseless *whether*-islands are concerned: they do not offer any real account.
- ii. The authors do not offer very strong arguments as for why manners have to be collective.
- iii. Finally, similarly to the syntactic accounts, Szabolcsi and Zwarts (1993)'s theory does not seem to be able to explain the modal obviation effects discovered by Fox and Hackl (2005) (cf.(7) above.) It is rather implausible that adding a modal should be able to turn the partially ordered domain of manners or degrees into sets, such that now the required algebraic operation could be performed⁸. Interestingly, modal obviation is not restricted to negative islands, other quantificational interveners seem to be sensitive to it as well. In particular, the missing reading of example (8) can be recovered by adding a modal (this fact was pointed out to me by B. Spector, pc.)⁹:

(14) How many pounds are you sure that every boy weighs?

⁸ However, Anna Szabolcsi (pc.) suggests that an account for modal obviation similar in spirit to that offered in this thesis might be possible to formulate in the framework of Szabolcsi and Zwarts (1993) as well.

The modal obviation facts therefore seem to constitute a serious problem for Szabolcsi and Zwarts (1993)'s account as well.

3.2 *What for split and Dynamic Semantics: Honcoop (1998)*

Honcoop (1998) formulates a dynamic semantic account for *what-for* split constructions in Germanic languages, which are usually taken to be sensitive to weak islands. His account is based on two very interesting observations. The first observation is that the interveners that make the *what-for* split impossible coincide with the class of expressions that create inaccessible domains for dynamic anaphora. This claim is based on the following facts:

- (15) *{no student/exactly 3 students/ more than 3 students/ I wonder whether John }
bought a book. It was expensive.

Such elements, he claims are the same as the ones that cause intervention in the case of the *what-for* split.

(16) *Honcoop (1998)'s generalization*

The class of expressions that induce weak islands coincides with the class of expressions that create inaccessible domains for dynamic anaphora.

Honcoop (1998)'s second interesting observation is that interveners for negative polarity licensing (as discussed originally by Linebarger (1981)) seem to be exactly the same class as the weak island interveners.

Honcoop accepts Szabolcsi and Zwarts (1993)'s explanation for weak islands in general, but he goes on to argue that neither the *what-for* split constructions nor the NPI intervention facts could be handled in terms of algebraic semantics. Instead, he argues, these cases should be handled in terms of dynamic semantics. In the version of dynamic semantics he assumes (Dekker (1993)), dynamic binding is made possible by the

⁹ A similar fact was also pointed out in Rullmann (1995), however he does not realize the significance of

operation of existential disclosure. However, existential disclosure cannot be performed across negation and other elements that create inaccessible domains. Now the fact that the *what*-for split is sensitive to negation should be understood as follows. First, observe the ungrammatical example of a *what*-for split in (17)b:

- (17) a. Wat_j heeft Jan voor een man_j gezien?
What has Jan for a man seen?
'What kind of man did Jan see?'
- b. *Wat_j heeft Jan niet voor een man_j gezien?
What has Jan not for a man seen?
'What kind of man didn't Jan see?'

The indefinite *een man* is construed as a property restricting the range of the variable quantified over by *wat*. To get this, we need to apply existential disclosure to it in order to be able to dissolve the existential quantifier by means of which *een man* is interpreted. In other words, the property reading of *een man* is derived by existential disclosure. However, existential disclosure cannot apply if negation interveners, and for this reason the property reading of *een man* cannot be derived. However, now the question cannot be interpreted any more.

Honcoop (1998)'s account offers some very creative observations. However, the basic notion, that *what*-for split is completely analogous to other weak islands do seem to raise some questions:

- i. While the class of interveners for the *what*-for split seems very similar to that of weak islands, it seems that the *what*-for split is more sensitive: quantifiers that are usually not taken to cause weak island effect (e.g. *at most 3*, *exactly 3*) seem to be strong interveners in the case of the *what*-for split¹⁰.

the example, he simply takes it as an argument against de Swart (1992)'s observation.

¹⁰ This in fact, seems also be true of the French *combien*-split.

- ii. Another discrepancy between the *what*-for split and ordinary weak islands is that in the case of the former, modal obviation does not seem to happen. The examples below illustrate the case of German. (However, note that interestingly, the French *combien*-split does improve, cf. the discussion in Spector (2005)).

(18) a. *Was hat Jan nicht für ein Buch gelesen? [German]

b. *Was hat Jan für ein Buch nicht gelesen?

“what kind of book has Jan not read?”

(19) a. *Was darf Jan nicht für ein Buch lesen?

b. *Was darf Jan für ein Buch nicht lesen?

c. Was für ein Buch darf Jan nicht lesen?

“what kind of book is Jan not allowed to read?”

(20) a. *Was ist Jan sicher für ein Buch nicht lesen zu wollen?

b. *Was ist Jan für ein Buch sicher nicht lesen zu wollen?

c. Was für ein Buch ist Jan sicher nicht lesen zu wollen?

“What kind of book is Jan sure not to (want to) read?”

(judgements courtesy of Michael Wagner, pc.)

4 Domain specific accounts¹¹: Negative degree islands: Rullmann (1995) and Fox and Hackl (2005)

In this section I turn to proposals that were proposed specifically to account for negative (and DE) degree islands. It is standardly assumed that a sentence such as (21) has the meaning that John has at least 3 children:


(21) John has 3 children = The degree d such that John has d children ≥ 3

Given this assumption, the propositions in the Hamblin denotation of a question such as the one below in will be strictly ordered by entailment, as shown in *Figure 1*. (The arrow indicates the direction of entailment.)

(22) How many children does John have?

Figure 1: Hamblin denotation of (22)

John has 1 child
John has 2 children
John has 3 children
John has 4 children
John has 5 children
...
 ∞



If the fact of the matter in the actual world is that John has exactly 3 children, there will be 3 propositions in the Hamblin set that are true. Yet we need to account for the intuition that the question is asking for a “maximal answer” in some sense. Rullmann (1995) and Fox and Hackl (2005) have observed that this requirement of degree questions might be also employed to account for the negative island effect in degree questions. This section briefly reviews these proposals.

4.1 von Stechow (1984) and Rullmann (1995)’s maximality condition

von Stechow (1984) has proposed that the negative island effect in comparatives (cf. (23)) can be explained by evoking maximality:

(23) *John is taller than Bill isn’t.

If, as von Stechow (1984) argues comparative clauses denote maximal degrees (cf. (24)), the negative island effect can be explained because in downward entailing contexts maximal degrees are not defined.

(24) John’s height is greater than the max(λd [Bill’s height is not d-much])

(25) $\text{Max}(D)=\{d \in D \wedge \forall d' \in D [d' \leq d]\}$

¹¹ There are further pertinent proposals that I will however not review here: Cresti (1995) proposes a syntactico-semantic account for wh-islands with degree questions, while Oshima (2007) proposes a pragmatically based account for certain islands created by factive verbs.

If Bill's height is 6 feet, the expression $\lambda d[\text{Bill's height is not } d\text{-much}]$ denotes the set of all heights greater than 6-feet. However this set lacks a maximum (i.e. a "largest element"), therefore the underlined part of the expression above is not defined¹².

Rullmann (1995) argues that von Stechow (1984)'s explanation for the negative island effects in comparative clauses can be carried over to negative degree questions. This is possible, he argues, if the meaning of a degree question as (26) is as shown in (27):

(26) How tall is John?

- (27) a. What is the maximal degree d such that John is d -tall?
 b. For what d , d is the $\max(\lambda d[\text{John is } d\text{-tall}])$

To derive this meaning for questions, he adapts Jacobson (1995)'s theory of free relatives (introduced briefly in Chapter 1 of this thesis) to degrees in the following way:

(28) *How tall isn't John?

- (29) a. What is the maximal degree d such that John is not d -tall?
 b. For what d , d is the $\max(\lambda d[\text{John is not } d\text{-tall}])$

Again, $\lambda d[\text{John is not } d\text{-tall}]$ denotes the set of degrees greater than John's height, which however does not have a maximum, and therefore the underlined expression will always be undefined. As a consequence, the negative island effect can be predicted in the same way as the comparatives above. In fact, a similar problem will always arise as long as the sentence contains downward entailing element. Downward entailing functions are those functions f for which for all X, Y in the domain of f , if $X \subseteq Y$, then $f(Y)$ entails $f(X)$. *Few boys* is an example of a downward entailing function, as the example below illustrates:

- (30) a. $\{x: x \text{ is (at least) 6 feet tall}\} \subseteq \{x: x \text{ is (at least) 5 feet tall}\}$

- b. few boys are 5 feet tall => few boys are 6 feet tall

Accordingly, a degree question that contains a DE operator will receive the following interpretation in Rullmann (1995)'s system:

- (31) *How tall are few boys?
- (32) a. What is the maximal degree d such that few boys are d -tall?
- b. For what d , d is the $\max(\lambda d[\text{few boys are } d\text{-tall}])$

However, given the entailment pattern illustrated above, the underlined part of the expression will again be undefined. Somewhat counter-intuitively perhaps, we can observe that the effect of the DE operator is that the predicate of degrees $P(\lambda d[\text{few boys are } d\text{-tall}])$ is upward entailing with respect to its degree argument. More precisely, with $d < d'$, it licenses the inference from $P(d)$ to $P(d')$:

- (33) a. 5 feet < 6 feet
- b. few boys are 5 feet tall => few boys are 6 feet tall

We will call such predicates upward-scalar predicates¹³. More generally then we might say that in Rullmann (1995)'s system an upward scalar predicate of degree P should be incompatible with degree-questions, i.e. questions of the form “For what d , d is the maximal degree in $P(d)$?” should be unacceptable with such a P .

4.2 Wrong predictions

As Beck and Rullmann (1999) note, this approach predicts the wrong outcome for questions such as the one below:

¹² Rullmann (1995) in fact assumes an exact semantics for scalar predicates, but the explanation goes through as well: $\lambda d[\text{Bill's height is } d]$ denotes a singleton set, the complement of which (all degrees greater or smaller than Bill's exact height) cannot have a maximum either.

¹³ Counter-intuitively, upward-scalar predicates happen to be downward-monotonic in a more general sense, i.e. relatively to their individual, non-degree, argument: this is because with $d < d'$, it turns out that the

(34) How tall is it sufficient to be (in order to play basketball)?

Suppose it is necessary and sufficient to be 7-feet tall. Then it is *a fortiori* sufficient to be 8-feet tall. Hence $\lambda d. it\ is\ sufficient\ to\ be\ d\text{-tall}$ is, in first approximation, upward-scalar. Therefore, (34) is predicted to be unacceptable by Rullmann (1995)'s theory. However, it seems perfectly acceptable. Notice that even if the context could restrict the domain of degrees somehow, making sure that there could be a maximum, Rullmann (1995)'s theory would still predict the wrong meaning for the sentence, because intuitively the sentence is felt to be asking for the *minimal* degree.

The second problem for Rullmann (1995)'s theory is the already mentioned observation made by Fox & Hackl (2005), according to which an existential modal under negation renders the negative degree question acceptable:

(35) How fast are we not allowed to drive?

The predicate $\lambda d. we\ are\ not\ allowed\ to\ be\ d\text{-fast}$ is still upward-scalar, hence predicted to be unacceptable by Rullmann (1995)' system, contrary to fact.

4.3 Replacing *Maximality* with *Maximal Informativity*

To remedy the problem with the questions involving *sufficient*, Beck and Rullmann (1999) propose to replace Rullmann (1995)'s concept of maximal answer with the concept of the maximally informative answer, where the maximally informative answer is the conjunction of all true propositions in the question extension. Now the meaning of a degree question can be informally paraphrased as below:

(36) $\text{How}_d\ \varphi(d)? =$ What is the degree d that yields the most informative among the true propositions of the form $\varphi(d)$?

denotation of *d-tall* includes that denotation of *d'-tall*, not the reverse, since being at-least d' -tall entails being at least d -tall.

Given this approach, Beck and Rullmann (1999) predict the following generalization for degree questions:

- (37) How $_d \phi(d)$?
- a. If ϕ is downward-scalar (i.e. $\phi(d+\epsilon)$ entails $\phi(d)$), the question asks for the *highest degree* d such that $\phi(d)$ is true
 - b. If ϕ is upward-scalar (i.e. $\phi(d)$ entails $\phi(d+\epsilon)$), the question asks for the *smallest degree* d such that $\phi(d)$ is true.

They show that this predicts the right results for questions involving *sufficient*: this is because now the question asks for the smallest degree sufficient to bake a cake.

However, as the authors themselves notice, while the account of Beck and Rullmann (1999) predicts the right results for the data in (34) and (35), now the basic explanation for the negative island effect is lost:

- (38) a. How tall isn't John?
b. For what d , John isn't d -tall
c. For what d , John is less than d -tall

Suppose that John's height is just below 6-feet. Then the set of true answers is:

- (39) {John isn't 6-feet tall, John isn't 6 1/2-tall, John isn't 7-feet tall,...}

Clearly *John isn't 6-feet tall* is the most informative answer. Yet the question seems unacceptable.

4.4. Fox and Hackl (2005)'s account: Dense scales

To remedy this situation, Fox and Hackl (2005) propose that the following hypothesis about degree scales should be assumed:

- (40) Measurement Scales that are needed for natural language semantics are always dense (*The Universal Density of Measurement* [UMD])

They argue that given the assumption that the set of degrees is now dense, there is no minimal degree that gives a maximally informative true proposition. Given this however, Dayal (1996) presupposition which requires the conjunction of all true answers (the most informative answer) to be an element of the question-extension can never be met, and negative degree questions will always result in presupposition failure. Imagine that in the case of (38) above John is exactly 6 feet tall. Then the set of all true propositions of the form John is not d-tall is the following:

- (41) { ...,John is not 6,000001 feet –tall, ..., John is not 6,05 feet tall,, John is not 6,1 feet-tall,..... }

The problem, according to Fox and Hackl's proposal is that there is no *minimal* degree d such that John is not d -tall. This is simply because for any $d > 6$ feet, there is a d' such that $d > d' > 6$ -feet. Therefore Dayal's condition cannot be met.

As noted above, Fox and Hackl (2005) make the very important observation that universal modals above negation, or alternatively existential modals below negation, have the capacity to save negative degree questions:

- (42) How much radiation are we not allowed to expose our workers to?
(43) How much are you sure that this vessel won't weigh?

Suppose that the law states that we are allowed to expose our workers to less than 100 millisievert/year of radiation and says nothing more. It follows that the set of worlds compatible with the law is $\{w: \text{the radiation is lower than 100 millisievert/year}\}$. So for any degree d of radiation below 100 millisievert/year, there is a permissible world in which the radiation is d . Hence for any degree of radiation smaller than 100 millisievert/year, we are allowed to expose our workers to that amount of radiation. On the other hand, we are not allowed to expose our workers to 100 millisievert/year.

Therefore, 100 millisievert/year is the smallest degree such that we are not allowed to expose our workers to d . As a consequence, Dayal's condition can be met. More generally, predicates of the form $\lambda d. \neg POSSIBLE(P(d))$ (or $\lambda d. NEC(\neg P(d))$) can denote closed intervals.

The account in Fox and Hackl (2005) makes the extremely important observation about modal obviation, and proposes a witty account to explain this pattern. Yet, we might ask some questions about the system that Fox and Hackl (2005) develop:

- i. F & H must extend this account even to cases where the domain of degrees is not “intuitively” dense, such as cardinality measures as in:
(44) *How many children doesn't John have?
Suppose Jack has exactly 3 children. Then he does not have 4 children, but he also does not have 3.5 children, or 3.00001 children...
- ii. Can it be extended to weak island extractees other than degrees?
- iii. Can it be extended to weak island creating interveners other than negation?

Naturally, the first objection is addressed in Fox and Hackl (2005), who in fact take it to be an argument for a very strong modularity assumption. According to this, the knowledge that the number of children someone has is an integer is a form of lexical/encyclopedic knowledge. However, this knowledge is not purely logical, (given some reasonable notion of logicity). Fox and Hackl (2005)'s claim is that Dayal's condition is computed only on the basis of the purely logical meaning of the question, i.e. is blind to contextual, encyclopedic or lexical information. While Fox and Hackl do provide some intriguing arguments for this view (some of which are completely independent of degree-questions), I believe it is still worthwhile to investigate an alternative.

The second question is also addressed in Fox (2007). He proposes that although UDM itself cannot be responsible for other types of extraction than questions about degrees, a broader generalization about non-exhaustifiable sets of alternatives can subsume both the cases that can be accounted for by the UDM, and other examples of non-exhaustifiability.

(45) *Fox (2007)'s generalization*

Let p be a proposition and A a set of propositions. p is *non-exhaustifiable* given A : $[\text{NE}(p)(A)]$ if the denial of all alternatives in A that are not entailed by p is inconsistent with p .

Further, he conjectures, that any account for negative manner questions should then fall under the generalization in (45) above.

The third question seems more problematic for Fox and Hackl (2005), as it is not clear that the account they offer for negative degree islands is extendable to other islands, e.g. presuppositional islands and tenseless *whether*-islands. It seems then that there are good reasons to keep on looking for an account that can be extended to these other cases of islands as well.

In what follows, I will propose an account that adopts the insight of Fox and Hackl (2005) that negative island violations result from a maximization failure. However, the approach that will be developed in the next chapters differs from their account in crucial respects:

- i. I will propose an interval-based account for negative degree questions that does not rely on the UDM. Rather, it will exemplify what might be called the symmetry generalization: Let p be a proposition and A a set of propositions: For any p , there are at least 2 alternatives in A such that each of them can be denied consistently with p , but the denial of both of these alternatives is inconsistent with p .
- ii. The reasoning in terms of symmetric alternatives can itself cover the cases of manner islands as well.
- iii. Further, the account can also explain the cases of presuppositional islands and whether islands, and make interesting predictions about certain cases of quantifier intervention.

Finally, I will also observe that while the symmetry generalization falls under Fox (2007)'s generalization, it is more restrictive than that, and makes different predictions about weak islands other than negation.

Chapter 3

Negative Islands*

1. Introduction

This chapter proposes an explanation for the oddness of negative islands, such as (1) and (2). These examples stand in contrast with the one in (3), which shows that a *wh*-word ranging over individuals can escape negation without any problem.

- (1) *How didn't John behave at the party?
- (2) *How many children doesn't John have?
- (3) Who didn't John invite to the party?

I will argue that the reason for the unacceptability of (1) and (2) is that they cannot have a maximally informative true answer. As it was reviewed in Chapter 1, Dayal (1996) has argued that a question presupposes that there is a single most informative true proposition in the Karttunen denotation of the question, i.e. a proposition that entails all the other true answers to the question. In this paper I show that in the case of negative manner and degree questions, Dayal (1996)'s presupposition can never be met. As a consequence, any complete answer to these questions will amount to the statement of a contradiction. The reason for this will be that for any proposition *p* in the question domain, there will be at least two alternatives to *p* that cannot be denied at the same time.

* I would like to express here my intellectual debt to Benjamin Spector, whose suggestion to use an interval semantics for degree constructions has improved the analysis that I eventually propose for the negative degree questions in this chapter greatly. Cf. Section 3 and in particular Section 3.2. for details.

In the case of manner questions the intuitive idea as for why these questions are bad is very simple: the domain of manners contains contrary predicates, such as *fast*, *slow*, *medium speed*, etc. However, as the domain of manners is structured in such a way that the predicates themselves are in opposition with each other, in the case of negative questions it will turn out to be impossible to select any proposition in the denotation of manner questions as the most informative true proposition. In the case of negative degree questions I will argue that the maximization failure is predicted if we assume an interval-based semantics of degree constructions.

An account for negative islands however not only has to apply for the odd examples above: it is also necessary to explain why in some cases the above examples can be rescued. There are two such cases in the literature. The first case is the important empirical observation made in Fox and Hackl (2005) (partly building on work by Kuno and Takami (1997)) according to which universal modals above negation, or equivalently, existential modals under negation save negative degree questions:

- (4) How much radiation are we not allowed to expose our workers to?
- (5) How much are you sure that this vessel won't weigh?

This pattern was noted for negative degree questions, but in fact it seems to be a general property of negative islands: (6) provides an example of a negative question about manners.

- (6) How is John not allowed to behave at the party?

The second way to improve negative islands was discussed by Kroch (1989) who showed that examples like (1) become acceptable if the context specifies a list of options (cf.(7))

- (7) How didn't John behave at the party: wisely or impolitely?

Explicit lists seem to improve negative degree questions to a great extent as well. This is exemplified in (8). However, notice that an answer “50” to be felicitous seems to require a context such that there be separate events of scoring 20, 30 and 40 respectively.

- (8) Among the following, how many points did Iverson not score?
A. 20 B.30 C.40 D.50

This chapter is organized as follows: Section 2 introduces the proposal for negative manner questions while Section 3 addresses negative degree questions. In Section 4 I will discuss some other instances of unacceptable negative questions such as questions with adjectives, as well as temporal and spacial modifiers in certain environments cf. (9)-(11).

- (9) *What isn't John like?
(10) *When didn't Jesus resurrect?
(11) *Where aren't you at the moment?

I will argue that these sentences can receive an explanation in a similar spirit as the examples with the manner and degree question. Finally in Section 5 I will discuss certain more general aspects of the present proposal and compare them to the generalization proposed in Fox (2007).

2. Negative islands created by manner adverbials

2.1 About manner predicates

2.1.1 Pluralities of manners

I will assume that manner predicates denote a function from events (e) to truth-values (t), or equivalently a set of events:

- (12) $[[\text{fast}]] = \{e \mid \text{fast } e\}$

Extending Landman (1989)'s version of Link (1983) to manner predicates, I will assume that we form plural manners as illustrated below:

$$(13) \quad \llbracket \text{fast+carelessly} \rrbracket = \{ \{ e \mid \text{fast } e \} , \{ e \mid \text{careless } e \} \}$$

Given this way of forming plural manner predicates, we arrive at a structured domain, not unlike that of the domain of individuals that was introduced in Chapter 1 (cf. Link (1983) and subsequent work.). Let's pause for a second and think about how a plural manner such as the one in (13) will be able to combine with a predicate of events. Since in this case we have sets of sets of events, predicate modification will not be able to apply in a simple fashion. Furthermore, if we look at an example such as the one below, we also want our semantics to predict that the running event in question was both fast and careless.

- (14) a. John ran fast and carelessly
 b. $\lambda w. \exists e [\text{run}(w)(e)(\text{John}) \wedge \text{fast+carelessly } (w)(e)]$

To resolve this type conflict and to derive the appropriate meaning, we will postulate an operator *D* that applies to plural manner predicates, much in the fashion of the distributive operator commonly assumed for individuals:

$$(15) \quad D(P_{PL}) = \lambda e. \forall p \in P_{PL} \ p(e)$$

Observe that talking about plural manners gives rise to all-or-nothing effects in the unmarked case.¹⁴ However the formula in (16)c only means that there is no event of running by John that was both fast and careless.

¹⁴ However, in some contexts it might be possible to understand such examples as if *and* was Boolean. To account for these cases we might say that *and* is in fact ambiguous between a Boolean and a plural-forming *and*. However, this will not change the reasoning because in the case of negative sentences the alternative that employs a Boolean *and* will not have a chance to be a maximally informative answer in any case. [thanks to Danny Fox (pc) for pointing this out to me.]

- (16) a. John didn't run fast and carelessly
 b. 'John run neither fast nor carelessly'
 c. $\lambda w. \neg \exists e [\text{run}(w)(e)(\text{John}) \wedge \text{fast+carelessly}(w)(e)]$

As reviewed in Chapter 1, a similar effect has been observed in the case of predication over plural individuals (cf. e.g. Löbner (1985), Schwarzschild (1993), Beck (2001), Gajewski (2005)). The standard treatment of this effect is the postulation of a homogeneity presupposition on the distributive operator¹⁵. Similarly, we will postulate a homogeneity presupposition on the D-operator introduced above:

- (17) $D(P_{PL}) = \lambda e: [\forall p \in P_{PL} p(e)] \text{ or } [\forall p \in P_{PL} \neg p(e)]. \forall p \in P_{PL} p(e).$

Let's look at an example of a positive question about manners. The Hamblin-denotation of the question will contain a set of propositions such as (18)b-c. Given our assumption that the domain of manners contains both singular and plural manner predicates, the question word *how* will range over both singular and plural manner predicates as well. Notice that I will assume that a question such as (18) talks about a contextually given event, which I will represent here by (e*). In other words the question in (18) is interpreted as 'How was John's running?'

- (18) a. How did John run?
 b. $\lambda p. \exists q_{\text{manner}} [p = \lambda w'. \text{run}(w')(e^*)(\text{John}) \wedge q_{\text{manner}}(w')(e^*)]$
 c. {that John ran fast, that John run fast+carelessly, etc..}

Given the D operator introduced above, the proposition that John run fast+carelessly will entail that John run fast and that John run carelessly. If this proposition is indeed the maximal true answer, we will conclude that John's running was performed in a fast and careless manner and in no other manner in particular.

¹⁵ The definition of the distributive operator for plural predicates over individuals was as follows:

(1) $\text{Dist}(P) = \lambda x: [\forall y \in x P(y)] \text{ or } [\forall y \in x \neg P(y)]. \forall y \in x P(y)$

2.1.2 Contraries and the ban on forming incoherent plural manners

The crucial assumption that I would like to introduce is that the domain of manners always contains contraries. The observation that predicates have contrary oppositions dates back to Aristotle's study of the square of opposition and the nature of logical relations. (cf. Horn (1989) for a historical survey and a comprehensive discussion of the distinction btw. contrary and contradictory oppositions, as well as Gajewski (2005) for a more recent discussion of the linguistic significance of contrariety). Contrariety is relation that holds between two statements that cannot be simultaneously true, though they may be simultaneously false. A special class of contraries are contradictories, which not only cannot be simultaneously true, but they cannot be simultaneously false either. Natural language negation is usually taken to yield contradictory statements (cf. e.g. Horn (1989)).

(19) Two statements are contraries if they cannot be simultaneously true

(20) Two statements are contradictories if they cannot be simultaneously true or false

A classic example of a pair of contrary statements is a universal statement and its inner negation (assuming that the universal quantifier comes with an existential presupposition) such as (21). Other examples of contrary statements include pairs of contrary predicates such as the sentences in (22) and (23), where it is impossible for a single individual to be both short and tall, or to be both completely red or blue. Contrary negation is also often manifested in English by the affixal negation *un-*, such as e.g. in the case of pairs of predicates like *wise* and *unwise* (24):

(21) a. Every man is mortal
b. Every man is not mortal (=No man is mortal)

(22) a. John is short
b. John is tall

(23) a. The table is blue
b. The table is red

- (24) a. John is wise
 b. John is unwise

What distinguishes then contrary predicates from contradictory predicates is that two contrary predicates may be simultaneously false: it is possible for a table to be neither red nor blue, for an individual to be neither tall or short, or neither wise or unwise. This is also shown by the fact that the negation of predicates is usually not synonymous with their antonyms: the statement that *John is not sad* e.g. does not imply that he is happy.

Similarly to other predicates then, the domain of manners also contains contraries. In fact I will claim that every manner predicate has at least one contrary in the domain of manners (which is not a contradictory). Moreover, we will say that for any pair of a predicate P and a contrary of it, P' , there is a middle-predicate P^M such that at least some of the events that are neither in P or P' are in P^M . (23) summarizes the conditions on the domain of manners:

- (25) Manners denote functions from events to truth values. The set of manners (D_M) in a context C is a subset of $[\{f \mid E \rightarrow \{1,0\}\} = \wp(E)]$ that satisfies the following conditions:
- i. for each predicate of manners $P \in D_M$, there is at least one contrary predicate of manners $P' \in D_M$, such that P and P' do not overlap: $P \cap P' = \emptyset$.
 - ii. for each pair (P, P') , where P is a manner predicate and P' is a contrary of P , and $P \in D_M$ and $P' \in D_M$, there is a set of events $P^M \in D_M$, such that for every event e in $P^M \in D_M$ [$e \notin P \in D_M$ & $e \notin P' \in D_M$].

I will assume that context might implicitly restrict the domain of manners, just as the domain of individuals, but for any member in the set $\{P, P', P^M\}$, the other two members are alternatives to it in any context. Some examples of such triplets are shown below:

- (26) a. P : wisely; fast; by bus
 b. P' : unwisely; slowly; by car
 c. P^M : neither wisely nor unwisely; medium speed; neither by car or by bus

Given what we have said above it is somewhat surprising that the sentences below are odd: if the conjunction of two predicates is interpreted as forming a plural manner, and homogeneity applies, (27)a should mean that John ran neither fast nor slowly. Similarly, (27)b should simply mean that John's reply was neither wise nor unwise. We have just argued above that it is a property of contrary predicates that they might be simultaneously false. So why should the sentences in (27) be odd?

- (27) a. #John did not run fast and slowly
b. #John did not reply wisely and unwisely

I will say that it is the presupposition on forming plural manner predicates $\{p_1, p_2\}$ that $p_1 \cap p_2 \neq \emptyset$. It is then for this reason that the sentences in (27) are unacceptable: e.g. the plural manner {fast, slow} is a presupposition failure since it is not possible for a running event to be both fast and slow at the same time, and therefore the plural manner cannot be formed.

I would like to suggest that this condition might be connected to a more general requirement that a plurality should be possible¹⁶. Spector (2007), who defends the view according to which the extension of plural common nouns contains both singularities and pluralities notes that the oddness of sentences like (28) is unexpected under this view: (28) should simply mean that John doesn't have a father, and hence should be acceptable. Spector (2007) claims that plural indefinites induce a modal presupposition according to which the 'at least two' reading of a plural noun should at least be possible. In the case at hand, the presupposition required that it should be at least possible to have more than one father.

- (28) #Jack doesn't have fathers.

Somewhat similarly, Szabolcsi and Haddican (2004) conclude that conjunctions, especially negated ones with homogeneity, have an "expected both" presupposition. It

¹⁶ The connection with Spector's work was brought to my attention by Giorgio Magri (pc).

seems then that our presupposition that gives the restriction on forming incoherent plural manners might be part of a more general requirement on forming pluralities. It seems then that our presupposition that gives the restriction on forming incoherent plural manners might be part of a more general requirement on forming pluralities.

To sum up, in this section we have introduced a couple of assumptions about manner predicates that all seem to be motivated independently. Manner predicates have contraries, plus there is a predicate that denotes a set of events that belong to neither p nor its contrary. These three predicates are alternatives to each other in any context. The final assumption was that it is impossible to form incoherent plural predicates, which seemed to be again a general property of forming pluralities.

2.2 The proposal: Negative Islands with manner questions

We finally have everything in place to spell out the account of negative manner questions. We will say that the reason for the ungrammaticality of questions like (1), in contrast to (3) (repeated below as (29) and (30)) is that there cannot be a maximally informative true answer to a negative question about manners.

(29) *How didn't John behave at the party?

(30) Who didn't John invite to the party?

Why? The reason is rooted in the fact that the domain of manners contains contraries. Let's see how.

2.2.1 Positive and negative manner questions

Let's look first at positive questions about manners. As I have suggested above, in any given context, the domain of manners might be restricted, but for any predicate of events p , its contrary p' and the middle-predicate p^M will be among the alternatives in the Hamblin set. Suppose that the context restricts the domain of manners to the dimension of wisdom. Now the Hamblin-denotation of (31) will contain at least the propositions in (31)b:

- (31) a: How did John behave?
 b. {that John behaved wisely, that John behaved unwisely,
 that John behaved neither wisely nor unwisely}

Suppose now that John indeed behaved wisely. Given that the three alternatives are exclusive (as contraries cannot be simultaneously true), if the Hamblin set contains only these three propositions, no other proposition will be true. In other words, the event in question (e^*) is an element of the set of events denoted by *wisely*, and not an element of any other set. This is graphically represented below:

- (32) $\frac{\text{e}^*}{\text{wise}} \quad \frac{\quad}{\text{med-wise}} \quad \frac{\quad}{\text{unwise}}$

Since in this case this is the only true proposition, this will at the same time be the most informative true answer as well. Note that if we had more propositions in the Hamblin set, e.g. *wisely*, *politely*, and their contraries respectively, as well as the plural manners that can be formed from these, the situation would be similar to questions that range over both singular and plural individuals. Suppose that John in fact behaved *wisely* and *politely*: given the distributive interpretation of plural predicates introduced above, this will entail that he behaved wisely and that he behaved politely, and imply that

Let's look now at a negative question. First imagine that our context restricts the domain to the dimension of wiseness.

- (33) a: *How didn't John behave?
 b. $\lambda p. \exists q_{\text{manner}} [p = \lambda w'. \text{behave}(w')(e^*)(\text{John}) \wedge \neg q_{\text{manner}}(w')(e^*)]$
 c. {that John did not behave wisely, that John did not behave unwisely,
 that John did not behave neither wisely nor unwisely}

Suppose that *John did not behave wisely* was the most informative true answer. This would mean that the only set of events among our alternatives which does not contain the event in question (e^*) is the set of wise events. But this means that the event in question

is both a member of the set of events denoted by *unwisely*, and the set of events denoted by *neither wisely not unwisely* (in short: *med-wisely*). This situation is graphically represented below:

- (34) a. John did not behave wisely
 b.

	e*	
wisely	med-wisely	unwisely

 →this cannot be true because of ((23) ii)

Yet, this cannot be true, because these two sets are exclusive by definition, and no event can be a member of both of them. Therefore (34) cannot be the most informative true answer to (33). What about an answer such as (35) below?

- (35) a. #John did not behave wisely and unwisely
 b.

	e*	
wise	med-wise	unwise

This answer is ruled out by the presupposition that excludes the formation of incoherent plural manners. The predicates *wisely* and *unwisely* are contraries, and therefore they cannot form a plural manner. (As mentioned above, this is also the reason why the sentence itself in (35) is odd.) Therefore the proposition that John did not behave wisely and unwisely is not in the set of alternatives. For this reason, (35) cannot be the most informative true answer. But now we have run out of options, if neither (34) nor (35) can be a maximal answer, there is no maximal answer. It is easy to see that if we had more alternatives, e.g. the alternatives based on wiseness and politeness, (i.e. *wisely*, *med-wisely*, *unwisely*, *politely*, *impolitely*, *med-politely* and the acceptable pluralities that can be formed based on these) the situation would be similar: Any answer that contains only one member of each triplet leads to contradiction, and any answer that contains more than one member of each triplet is a presupposition failure. There is no way out, no maximal answer can be given. Notice also that in the case of questions about individuals a similar

problem does not arise and therefore there is no obstacle for there being a maximal answer to these questions. For this reason, we predict the question in (3) to be acceptable.

It should be noted that given the similarity of selecting a complete answer to definite descriptions, the above account predicts that definite descriptions such as (36) should be also unacceptable:

(36) #the way in which John didn't behave.

This prediction is indeed borne out. The reason is of course that there is no maximum among the various manners in which John did not behave.

2.2.2 On contradiction and grammaticality

Recall that in Chapter 1 I have followed Gajewski (2002) in claiming that we need to distinguish between analyticity that results from the logical constants alone, from analyticity that is the result of the non-logical vocabulary. I have also adopted Gajewski's proposal according to which the former plays an important role for natural language: he argues that sentences that express a contradiction or tautology by virtue of their logical constants are ungrammatical. In other words he argues that it is L-analyticity, as opposed to plain contradiction, that leads to ungrammaticality. If it is correct that Gajewski (2002)'s proposal can be used to explain the ungrammaticality that we observe in the case of weak islands, then we should show that complete answers to negative manner questions are L-analytical. What we are looking for is to show that a complete answer to a negative manner question remains ungrammatical under any variable assignment. This is indeed the case. This is because for any predicate of manners p , the set of alternatives will always contain its contrary manner p' as well as a third manner predicate p^M that expresses that the event was neither p nor p' . This will have the consequence that the set of propositions that a complete answer to a negative manner question requires to be true is always incoherent. Thus complete answers to a negative manner question are L-analytic, and hence, predicted to be ungrammatical by Gajewski (2002)'s condition.

2.2.3 Blindness

One might wonder why it is that the examples below do not make the negative manner questions grammatical¹⁷:

- (37) A: *How didn't John behave?
B: Politely, e.g.
B' Not politely.

- (38) *Bill was surprised how John didn't behave.

In other words, there are contexts by which a non-complete or mention-some answer can be forced, suggested or at least made possible. The marker *e.g.* explicitly signals that the answer is non-complete (cf. e.g. Beck and Rullmann (1999) on discussion), and as such the answer in (37)B should be contradiction-free. If so, we might expect that the existence of this answer should make the question itself grammatical. Negative term answers as (37)B' are usually also not interpreted as complete answers, as can be seen in exchanges such as *Who came? Not John.*¹⁸ Finally, some verbs that embed questions with their weak meaning, such as *surprise* or *predict* might in fact be true under a “very weak” meaning: one might be surprised by who came, if one expected only a subset of the people among those who came to come. (cf. Lahiri (1991), Lahiri (2002)). In these cases too, we might expect the sentences to improve, contrary to fact.¹⁹ Why is it that these instances of partial answers do not make negative manner questions good? In other words, since grammar also allows for weaker than strongly exhaustive readings, why can the hearer not recalibrate the condition on complete answers into a weaker requirement, that of giving a partial answer?

¹⁷ (37)B was pointed out to me by Irene Heim and David Pesetsky (pc), while (37)B' and (38) were brought to my attention by Emmanuel Chemla (pc)

¹⁸ Although von Stechow and Zimmermann (1984) report somewhat different judgements from mine and Spector (2003). On the other hand, if a negative term answer were to be interpreted exhaustively, then if we only have three alternatives: {*politely*, *impolitely*, *mid-politely*} we should infer from the answer in (37)B' that John behaved politely, and in no other way, which is not a contradiction in itself.

¹⁹ The examples with *predict* seem better, however one should be cautious: Given that *predict* selects for future tense, these examples are in fact parallel to the cases with modals, discussed in the next section. Their acceptability therefore should get the same explanation as that of the modals.

I would like to argue that this apparent problem is in fact part of larger issue of the impenetrability of the linguistic system for non-linguistic reasoning, or reasoning based on common knowledge. As the requirement of the linguistic system is that there be a most informative true answer to the question, in the rare cases where this leads to a contradiction, we cannot access and recalibrate the rules for the felicity conditions on a question. Similar conclusions about the modularity of the various aspects of the linguistic systems were reached by Fox (2000) and Fox and Hackl (2005) about the nature of the Deductive System (DS) that he proposes, as well as in the above discussed Gajewski (2002). Similarly, Magri (2006) and subsequent work argues based on various examples that implicature computation should be blind to common knowledge. I contend then that the above observed impossibility of scaling down on our requirements based on contextual knowledge is part of a larger pattern of phenomena, where such adjustments to the core principles seem to be unavailable.²⁰

2.3 Ways to rescue Negative Islands

It was already mentioned briefly that explicit context restriction can rescue negative manner questions, as first observed by Kroch (1989). A second way to save negative island violations has been discovered by Fox and Hackl (2005) (partly based on Kuno and Takami (1997)): negative islands become perfectly acceptable if an existential modal appears under negation. This section shows that both of these facts are predicted by the present account in a straightforward manner.

2.3.1 Modals

Fox and Hackl (2005) (partly based on observations by Kuno and Takami (1997)) have noted that certain modals can save negative island violations: more precisely negative islands can be saved by inserting existential modals below negation or by inserting universal modals above negation:

(39) How is John not allowed to behave?

(40) How did John certainly not behave?

²⁰ Thanks to Giorgio Magri for discussion on this issue.

The reason why these are predicted to be good in our system is that the contrary alternatives that are required to be true by exhaustive interpretation of the complete answer can be distributed over different possible worlds, hence the contradiction can be avoided: Notice that unlike before, we are not talking about a specific event any more, but the event is existentially quantified over. The existential quantification is presumably provided by the existential modal.

- (41) $[[\text{How is John not allowed to behave?}]^w$
 $=\lambda p. \exists q_{\text{manner}} [p=\lambda w'. \neg \exists w''_{\text{Acc}(w', w'')}. \exists e[\text{behave}(w'')(e)(\text{John}) \wedge q_{\text{manner}}(w'')(e)]]$

Imagine again a scenario, in which we have restricted the domain to the dimension of politeness. As before, the set of alternatives will at least include three contrary predicates: *politely*, *impolitely* and *neither politely nor impolitely* (represented below as med-politely)

- (42) a. John is not allowed to behave impolitely.
 b. $\underline{\quad} \diamond \exists e \underline{\quad}$ $\underline{\quad} \diamond \exists e \underline{\quad}$ $\underline{\quad} \neg \diamond \exists e \underline{\quad}$
 politely med-politely impolitely

There is no obstacle in this case for choosing a most informative answer, e.g. (42) above. This is because it might be the case that *impolitely* is indeed the only manner in which John is not allowed to behave, and in every other manner he is allowed to behave. In other words, it is allowed that there be an event of John behaving in a polite manner, and that there be another event of John behaving in a med-polite manner. The contradiction is resolved by distributing predicates over different worlds and events. Since universal modals above negation are equivalent to existential modals below negation, the same reasoning holds for (40) as well²¹. On the other hand we predict manner questions where

²¹ However, notice that ability modals seem to be more complicated than the existential modals above
 (1) *How can't you photograph the house? (cf. Kuno and Takami (1997))

universal modals can be found under negation to be unacceptable. This is because in this case, instead of distributing the mutually exclusive propositions over different worlds, we require them to be true in every possible world, which of course is impossible (Notice that assuming as before that the universal modal quantifies over worlds and events, the event variable is now universally quantified over.)

(43) *How is John not required to behave?

(44) [[How is John not required to behave?]]^w

$$= \lambda p. \exists q_{\text{manner}} [p = \lambda w'. \neg \forall w'' \text{Acc}(w', w'') \forall e [\text{behave}(w'')(e)(\text{John}) \wedge q_{\text{manner}}(w'')(e)]]$$

Why is the sentence in (45) below unacceptable as a maximal answer?

(45) a. #John is not required to behave impolitely.

b. $\square \forall e$ $\square \forall e$ $\neg \square \forall e$
 politely med-politely impolitely

The problem is that if *impolitely* is the unique manner such that John is not required to behave that way, then for the other two alternatives it must be the case that John is required to behave in that manner: However, this is again a contradiction as these manner predicates are exclusive. Furthermore, just as we have seen before in the case of non-modal negative manners, it is not possible to form incoherent plural manners, therefore an answer such as #*John is not required to behave politely and impolitely* will not be possible either.

(2) *How are you not able to eat a mango?

But notice that in these cases also the corresponding positive questions don't seem to be good:

(3) ???how can you photograph the house?

(4) ???how are you able to eat a mango?

Though the positive cases improve with past tense:

(5) How could you solve the exercise

I have no explanation for these facts, however I suspect that the problem in these cases arises from the actuality entailment of ability modals in some contexts (cf. Hacquard (2006)).

2.3.2 Explicit domains

If we restrict the set of possible answers in appropriate ways, we might get rid of the contradictions that cause problems. An example of this effect might be if we simply list the potential alternatives. The relevant observation goes back to Kroch (1989):

(46) How did you not behave: A-nicely, B-politely, C-kindly?

In this case the set of alternatives is restricted to the non-plural manners A, B, C, (and potentially the sets that can be formed of these, depending on the rules of the multiple choice test). As this set does not have to contain any contraries, the difficulties that lead to a weak island violation do not arise here, and hence the question is predicted to be good. This is because by restricting the domain it becomes possible to choose a predicate among the alternatives such that it is a complete answer to the question, and it does not lead to any contradiction. In fact in the above example there are no contraries at all, therefore any answer based on these alternatives can in principle be a good answer. Similarly, it is easy to see that in most explicitly listed domains it will be possible to select a complete answer, at least as long as the domain does not contain more than two mutually exclusive manner predicates per each dimension of manners. In fact we predict that if the list contained three predicates of manners that are mutually contraries to each other, the question should still be bad. I think that this prediction is indeed borne out:

(47) *How do you not speak French? A: very well B: so-so C: badly

The problem is that on the one hand a complete answer such as *I do not speak French* [$\alpha+\beta$] violates the presupposition against forming incoherent manner predicates, but the complete answer *I speak French* α leads to a contradiction.

2.4 Interim summary

In this section I have argued that the felicity condition on asking a question according to which the speaker should be able to assume that the hearer might be able to know the most informative answer can never be met in the case of negative manner questions. This was because the domain of manners contained atoms that were not independent from each other: the domain of manners contained contraries. Therefore a truth of an (atomic) proposition in the H/K denotation of such questions had consequences for the truth of other atomic propositions. This state of affairs in the case of negative questions resulted in a situation in which it was not possible to select a maximal answer.

3 Negative islands with degree questions

This section looks at negative degree questions. The basic contrast to be explained is the one exemplified below: while the positive degree questions are perfectly acceptable (48), their negative counterparts in (49) are not:

- (48) a. How tall is John?
b. How much milk did John spill on his shirt?
- (49) a. *How tall isn't John?
b. *How much milk didn't John spill on his shirt?

In fact a similar contrast can be observed in the case of grammatical *How many* questions, albeit with a twist. It has been argued by Longobardi (1987), Kroch (1989), Cinque (1990), Cresti (1995), Rullmann (1995) among others that certain questions that contain the existential noun phrase *how many NP* have two different readings. Observe first the example below:

- (50) How many books do you want to buy?
- a. 'For what number *n*, there are *n*-many (particular) books *x* such that you want to buy *x*?'
b. 'For what number *n*, you want it to be the case that there are *n*-many books *x* such that you buy *x*?'

The two readings can be distinguished by the following two scenarios. Imagine that you set out on a mission to buy some books for your grandmother’s birthday. I have reasons to believe you do not yet know which books these should be, but you know that you want to buy a certain number of books. I ask you (50): in this scenario the question is more easily understood with the second reading. The first reading becomes more salient once I believe you have a set of particular books in mind and I am interested in the cardinality of this set. The first reading has been sometimes called D-linked (in the sense of Pesetsky (1987)), or “referential reading” in the syntactic literature. (cf. e.g. Cinque (1990), Rizzi (1990) and others). This is however somewhat misleading, as *How many* phrases (or other *wh*-phrases, in fact) cannot be said to refer in any sense. It seems rather that what we observe is a scope phenomenon²². It has been argued that the *How many NP* can be decomposed into two quantifiers: a quantifier over degrees and an existential quantifier over individuals (cf. Cresti (1995), Rullmann (1995), Romero (1998), Hackl (2001) among others for discussion). What we seem to observe then in these cases is that the existential quantifier over individuals can take scope either above or below some other scope bearing element²³. In the previous example, the existential noun phrase *n-many books* can be understood as having scope over the attitude verb *want* (51)a, or with a reconstructed scope under the attitude verb (51)b:

(51) How many books do you want to buy?

- a. Wide scope reading: ‘for what number *n*, there are *n*-many (particular) books *X* such that you want to buy *X*’

$$[[(51)]]^w = \lambda p. \exists n \in N^+ [p = \lambda w'. \exists X [\text{book}(X)(w') \ \& \ |X|=n \ \& \ \mathbf{want} \\ (\lambda w''. \text{buy}(\text{you})(X)(w''))(w')]]$$

²² The ambiguity is somewhat reminiscent of the de re/de dicto ambiguity, but there are in fact differences (cf. Rullmann (1995) for discussion).

²³ As usual with these types of ambiguities, in this example the wide scope existential reading in fact entails the narrow scope reading.

- b. Narrow scope (reconstructed) reading: ‘for what number n, you want there to be n-many books X such that you buy X’ (i.e. what amount of books do you want to buy?)

$$[[(51)]]^w = \lambda p. \exists n \in N^+ [p = \lambda w'. \mathbf{want} (\lambda w''. \exists X [\text{book}(X)(w'') \ \& \ |X|=n \ \& \ \text{buy}(\text{you})(X)(w'')])] (w')$$

It has been long observed that the two readings behave differently in the context of weak-island inducers: the narrow scope reading is sensitive to weak islands, but the wide scope reading is not. The examples below show that this is indeed the case with negative islands as well: the question below is only felicitous if it asks about a particular set of books, i.e. on the wide scope reading:

(52) How many books didn't you buy?

- a. Wide scope reading: ‘For what number n, n is the cardinality of the set of books that you did not buy?’
 $\lambda p. \exists n \in N^+ [p = \lambda w'. \exists X [\text{book}(X)(w') \ \wedge \ |X|=n \ \wedge \ \neg \text{you bought}(X)(w')]]$
- b. #Narrow scope reading: ‘For what number n, you did not buy n-many books?’
 $\# \lambda p. \exists n \in N^+ [p = \lambda w'. \neg \exists X [\text{book}(X)(w') \ \wedge \ |X|=n \ \wedge \ \text{you bought}(X)(w')]]$

In the case of certain *how many* questions, the wide scope reading is not possible, and the question becomes unacceptable altogether, as can be seen below:

(53) *How many children don't you have?

In the degree questions such as in (49) there is no existential quantifier over individuals and hence they only have the reading analogous to the narrow scope reading. Similarly to the above example then, these questions are also unacceptable, as shown below:

(54) [*How tall isn't John?]^w=

$$= \lambda p. \exists d [d \in D_d \ \wedge \ p = \lambda w'. \neg \text{John is } d\text{-tall in } w']$$

‘For what degree d, John is not d-tall?’

The question that arises then in the context of negative islands is what rules out degree questions and the narrow scope reading of *how many* questions. It seems though that the disappearance of the narrow scope reading in negative island contexts should be due to exactly the same reasons that render the questions in (49) unacceptable. In this part of the chapter I will present an account of negative degree and numeral questions along these lines: it predicts that degree questions and narrow scope existential readings of *How many* questions should be unavailable because they lead to contradiction. In the case of the wide scope reading of *how many* questions a contradiction is not generated in negative island contexts, hence the questions that can have a wide scope reading are acceptable, but only on this reading.

Before proceeding to the analysis, two things should be pointed out. The first is the already familiar observation from Fox and Hackl (2005), which states that universal modals above negation, or equivalently, existential modals under negation save negative degree questions:

- (55) How much radiation are we not allowed to expose our workers to?
- (56) How much are you sure that this vessel won't weigh?

This observation of course equally holds for the narrow-scope existential reading of *How many* questions: Modal obviation makes this reading available again:

- (57) How many books are you not allowed to buy?
 - a. 'For what number *n*, you are not allowed to buy *n*-many books?'
 - b. 'For what number *n*, *n* is the cardinality of the set of books that you are not allowed to buy?'

Thus we are looking for an account that can explain not only the unavailability of narrow scope existential readings in the contexts of negative islands, but can also explain these modal obviation facts.

The second observation that should be mentioned at this point is the following. When negative degree questions are acceptable, for example because they contain an

existential quantifier under negation, three different types of answers can be given to them

- (58) a. How much are you sure that this vessel won't weigh?
b. 5 tons
i. 'I am sure that this vessel will not weigh exactly 5 tons'
ii. 'I am sure that this vessel will not weigh 5 tons or more'
b'. Between 5 and 7 tons.
iii. 'I am sure that this vessel will not weigh between 5 and 7 tons, (but I believe it might weigh less or more than that)'

The only existing account that is capable of addressing the problem of modal obviation, that of Fox and Hackl (2005), however cannot account for all the range of possible answers that are available for acceptable degree questions. While the availability of reading (i) and the questions it poses for Fox and Hackl (2005)'s analysis was already pointed out in Spector (2004), and discussed in Fox and Hackl (2005), the availability of the interval reading has not yet been discussed in the literature. It seems however that an account such as Fox and Hackl (2005) cannot easily handle such interval readings. Thus the desideratum for a successful account is not only that it should be able to explain the negative island and the modal obviation facts, but also that it should predict the proper range of available readings, including the interval reading.

This section aims to show that the problem of negative degree questions can be reduced to the problem of having two alternatives that cannot be excluded at the same time. The section is composed of two parts: the first part (Section 3.1.) introduces a toy account that will pave the way for the actual account to be proposed in Section 3.2.

3.1 Towards an account: A naïve attempt using exact meanings and its problems

Imagine that we wanted to keep the idea from Fox and Hackl (2005) that degree questions ask for the most informative answer, but without the density assumption. We have seen in Chapter 2 that as long as degree predicates denote monotonic functions this would so far predict that the negative degree questions should be acceptable. Recall the

example *How many children don't you have?* It seemed that without the density assumption there should be a most informative answer in this case: E.g. in a scenario where you have 5 children, not having 6 children would entail all the other true answers (i.e. not having 7 or more children etc.) Therefore Dayal (1996)'s condition should be met, and the question should be acceptable—contrary to fact.

Yet perhaps there are ways to avoid this conclusion. First, let's experiment with the following idea. Suppose we assumed for a moment that for some reason or other, numerals and degrees in questions only had exact readings. As for numerals, we could e.g. allow for ambiguity of these expressions between the 'at least' and 'exact' readings in general (e.g. à la Geurts (2006) or Spector (2005) or Fox (2006)) but restrict questions about numerals to only allow exact readings²⁴. As for questions about degrees, we would restrict the meaning of the degree adjective in questions to the one shown below:

(59) $[[\text{tall}]] = \lambda d_d. \lambda x_e. x\text{'s height} = d$

It is easy to see that this would predict in a straightforward way that the narrow scope reading of negative degree questions should be unacceptable:

(60) $[[*\text{How many children doesn't John have?}]]^w =$

$= \lambda p. \exists n [n \in N^+ \wedge p = \lambda w'. \text{John doesn't have exactly } n \text{ children in } w']$

'For which number n , John doesn't have exactly that number of children?'

(61) $[[*\text{How tall isn't John?}]]^w =$

$= \lambda p. \exists d [d \in D_d \wedge p = \lambda w'. \neg \text{John's height} = d \text{ in } w']$

'For what degree n , John's height is not exactly that degree?'

Clearly, if the situation is such that John has exactly 3 children, there can be no most informative answer to the question in (60). Moreover, as it will be shown shortly, this

²⁴ This might be achieved in a number of different ways: we could speculate that this should follow from a presupposition associated with numeral questions (cf. Spector (2004)), or devise a metric that only allows

problem would disappear in modal obviation contexts. However, we have just seen in the previous section that when degree questions are acceptable, the exact reading is not the only available reading for an answer to a question about numerals, in particular, an answer to such questions also allows an ‘at least’ reading, at least. How is this compatible with the assumption that in degree questions the exact reading is forced? One thing that we might say is that such a reading of the answer could come about via pragmatic means. A possibility as to how such a pragmatic effect could be generated might be to interpret, in particular contexts, the exact reading as a type of mention-some answer. Some support for an analysis that derives the ‘at least’ readings as a pragmatic effect, might come from facts that show that the ‘at least’ reading can in fact be fairly easily turned into an ‘at most’ reading depending on world knowledge/context (similar facts about the context-reversability of the scales induced were noted e.g. in Jespersen (1933), Horn (1972) and subsequent literature):

- (62) a. How much did no one score?
b. 10 points.

Suppose we are playing a game where what is hard is to score a lot of points: The answer seems to imply that no one scored ten or more points. On the other hand imagine now that we are playing golf, where what is hard is to score 1 point, while scoring lots of points is easy: the answer seems to imply that no one scored ten or less points. Let’s look at another example to illustrate the same point:

- (63) a. How many children are we not allowed to have?
b. 2.

Most certainly, the answer “2” above can be interpreted as ‘two or more’ in a context where the problem seems to be overpopulation (E.g. China). Less easily perhaps, but conceivably the answer “2” can also be interpreted as ‘two or less’ if we are talking about

‘at least’ readings of numerals when some constituent other than the numeral is focussed/questioned in the sentence

a context where the problem is that not enough children are born (E.g. some orthodox neighborhoods).

In other words it seems that we might experiment with the following reasoning:

(64)

- i. Degree/numeral questions only allow for the exact reading. Hence, when the exact reading generates a contradiction, the question is unacceptable.
- ii. When questions about numerals are acceptable however, we might modulate the answers (by pragmatic means) to derive an ‘at least’/‘at most’ reading.

The next section (3.1.1) presents how such an account could look like in more detail, the section after that (3.1.2) will point out why such a view is untenable however. (The impatient reader might jump therefore to section 3.2. already)

3.1.1 An attempt using exact readings

First, let’s observe again that if numerals had exact readings in basic degree questions, then any complete answer to a negative question would require that a number of mutually incompatible statements should hold at the same time.

(65) $\llbracket \text{[*How many children doesn't John have?]} \rrbracket^w =$

$$= \lambda p. \exists n [n \in \mathbb{N}^+ \wedge p = \lambda w'. \text{John doesn't have exactly } n \text{ children in } w']$$

Clearly, if e.g. John has 3 children, there is no most informative answer to the above question. If a modal expression of the right type intervenes however, there might be a most informative answer. This is because as soon as we distribute the mutually exclusive alternatives over different times/worlds/individuals, the contradiction disappears.

(66) $\llbracket \text{[How much radiation are we not allowed to expose our workers to?]} \rrbracket^w =$

$$\lambda p. \exists n \in \mathbb{N}^+ [p = \lambda w'. \neg \exists w''_{\text{Acc}(w', w'')} \text{ we expose our workers to exactly } n \text{ radiation in } w'']$$

‘For what n, we are not allowed to expose our workers to exactly n radiation?’

It is easy to see that in this case there might be a most informative answer. E.g. it might be the case that we are not allowed to expose our workers to exactly 76 millisieverts/year, but more or less is acceptable. In this case “76” can in fact be the complete answer, and we do not run into contradiction. Similarly, existential quantifiers over individuals are predicted to remedy the problem as well:

(67) $\llbracket \text{How much did no one score?} \rrbracket^w$

$$= \lambda p. \exists n [n \in \mathbb{N}^+ \wedge p = \lambda w'. \neg \exists x. x \text{ scored exactly } n \text{ in } w']$$

If, for example 77 is the only amount such that no one scored that much, then “77” might in fact be the complete answer to the above question. What we can observe then is that while a plain negative question will not have a maximally informative answer in any context, there are contexts that make (66) and (67) acceptable.

A universal modal under negation on the other hand does not dissolve the problem like the existential modal above did:

(68) $\llbracket \text{How much radiation are we not required to expose our workers to?} \rrbracket^w$

$$= \lambda p. \exists n [n \in \mathbb{N}^+ \wedge p = \lambda w'. \neg \forall w''_{\text{Acc}(w', w'')} \text{ we expose our workers to exactly } n \text{ radiation in } w'']$$

‘For what n, we are not required to expose our workers to exactly n radiation?’

In this case again there can be no most informative answer: a proposition of the form “we are not required to expose our workers to d radiation” could only be a complete answer if it was possible that the two propositions that we are required to expose our workers to exactly d+1 radiation and that we are required to expose workers to exactly d+2 amount of radiation be true in the same world. As these are contradictory however, there cannot be such a world. Therefore, there cannot be a most informative answer to such questions. We see then why the exact readings predict that the plain negative numeral questions

should be ungrammatical, but that an existential quantifier under negation or a universal quantifier above negation should remedy the situation²⁵.

Thus we have seen that negative degree questions that contain an existential quantifier under negation have a non-contradictory complete answer assuming that the meaning of the numeral is ‘exact’ in questions. But we also know that when these questions are grammatical, they are in fact ambiguous between the exact and an ‘at least’/ ‘at most’ readings. How should we derive this? We can observe first that even though the question alternatives are exclusive, and hence they are not ordered by entailment, they might be still ordered by likelihood/scale of difficulty/probability etc. (for example by how hard it is to score, assumptions about laws, etc). Now suppose that we are in a context in which in fact many of the alternatives in the question denotation are true: E.g. no one scored exactly 10, exactly 11, exactly 12.... ad infinitum. Now, the situation is very similar to a mention-some question: we have a number of alternatives that are true, and that do not entail each other, but are ordered in terms of some pragmatic consideration/likelihood/relevance etc. The complete answer should choose the most relevant answer.

How do we achieve this? Recall that so far we have been assuming that a complete answer yields the most informative true answer among the true propositions. Yet, as the existence of mention-some questions shows, this cannot be the only type of legitimate answer. We could therefore attempt at a broader generalization, one that encompasses the previous notion of a complete answer, as well as predicting the existence of mention-some questions [cf. van Rooy (2003), van Rooy and Schulz (2005) for a related proposal]: A complete answer then will say that p is the most relevant true answer among the question alternatives. Naturally, if the alternatives are ordered by entailment, then ‘less relevant’ will be interpreted as ‘entailed’.

(69) For Q , a set of alternative propositions to a Question, and $\|a\| \in Q$

$$\text{Exh}(a) = a \ \& \ \bigwedge \{ \neg \beta \mid \beta \in \text{Excl}(Q) \}$$

²⁵ Note that this reasoning about modal obviation in negative degree questions is very similar to certain analyses of the curious interaction of modals with polarity items: cf. e.g. Chierchia (2004), Menendez-Benito (2005) Fox (2006), Guerzoni (2003)

where

$\text{Excl}(Q)$ is the set of excludable alternatives in Q , here the alternatives that are not less *relevant* than α .

In the case of a typical mention-some question, such as (70), an answer such as *Two blocks from here* will imply that is the most relevant true answer, in other words there is no easier/less effortful/relevant way of getting an Italian newspaper. Of course, it does not imply that one cannot get an Italian newspaper in Rome, but unless we are in Rome that fact will not be relevant.

(70) Where can I get an Italian newspaper?

Similarly, a degree question then could invoke a mention-some answer. I will present this idea here only very impressionistically, for the reason that this is not the proposal that I will adopt. Suppose that we assign probabilities to alternative propositions on the scale of 0 to 1, and define relevance as the degree of affecting the probability assigned to a proposition²⁶. Learning then that an alternative with a low probability is true (e.g. $0,1 \rightarrow 1$) would be more relevant than learning that a proposition with a high probability is true (e.g. $0,8 \rightarrow 1$). Take a question like the one below:

(71) How much can you score?

Intuitively, if we are in a context in which scoring a lot of points is hard and therefore it has a low probability, while scoring little is relatively easy, the proposition that gives the maximal degree such that you can score exactly that much will be at the same time the most relevant answer. If we were in a context in which it was difficult to score few points, but easy to score a lot of points, then the minimal degree should be the most

²⁶ This approach is inspired by the notion of relevance of Merin (1999), Merin (2003), however his definition of relevance—it seems to me—is not easy to adopt for handling wh-questions. Another metric of relevance proposed in the literature is that of van Rooy (2003) and Parikh (2006) e.g. which states that information is more relevant the more it changes expectations. This approach also seems to be able to capture the intuition described above in a more formal way. However spelling out these approaches in more detail here would take us too far down this gardenpath.

relevant at the same time. In the case of a negative question, on the other hand, if not scoring a lot is what is hard/expected, then not scoring less is more noteworthy than not scoring more. Therefore the proposition that no one scored n is more noteworthy than the proposition that no one scored $n+1$. Thus the complete answer to (72) *No one scored exactly 4* will mean that none of the more desirable/more relevant worlds are true, i.e. someone scored exactly 3 or less.

(72) How much did no one score?

3.1.2. The problem for this view

The argument sketched above rested on the assumption that for some reason in degree questions the ‘at least’ construal is blocked semantically, though it might be available pragmatically. [Note that Spector (2004) presents a different account to negative degree questions based on a similar approach as well.] However, it seems that this proposal cannot be successfully argued. The problem is posed by sentences that contain a universal modal, such as the example below²⁷:

(73) How tall are you required to be to be a basketball player?

An answer to this question such as “180cm” seems to be compatible with the ‘at least’ reading, in fact that is the most natural understanding of such an answer. However, this is in fact incompatible with what should be the semantic meaning of this question based on what has been said above. This is because if one is required to be exactly 180cm, tall to be a basketball player, that in fact excludes a situation where one is 181cm and one is a basketball player. This runs contrary to our intuitions in this case however.

One way of how to get out of this conundrum could be to assume that the question above in fact has some representation akin to the following:

(74) $\llbracket (73) \rrbracket^w = \lambda p. \exists n \in \mathbb{N}^+ [p = \lambda w'. \text{if you are exactly } n\text{-tall in } w' \rightarrow \text{you can be a basketball player in } w']$

However, it is not easy to see how this interpretation could be derived in a compositional fashion from (73). Luckily, we do not have to resort though to some *Deus ex Machina*: and this is because by changing one aspect of the above outlined theory this problem disappears. This is the topic of the next section.

3.2. The Solution Proposed

The solution in this section is based on a suggestion made by Benjamin Spector (pc) to use a degree semantics based on intervals to remedy the problem with *require*. Such an account of degree constructions was originally proposed in Schwarzschild and Wilkinson (2002), and was also adopted (with some modifications) by Heim (2006). As it turns out, adopting an interval based degree semantics results in a much more elegant theory overall than the one outlined in the previous section: while preserving all the good aspects of the previous version, it does not force us to adopt some of the more dubious aspects.

3.2.1. Degree semantics based on intervals: Schwarzschild and Wilkinson (2002), Heim (2006).

A long-standing problem in the domain of comparatives is the puzzle that is exemplified by sentences such as (75) below: (cf. Heim (2006) and references therein)

- (75) John is taller than every girl is.
- a. Actual meaning: ‘for every girl x: John is taller than x’
 - b. Predicted meaning : ‘John is taller than the degree d such that every girl is tall to that degree d. ’

To spell out what the puzzle is, we need to provide a brief background on the interpretation of comparatives. Recall the traditional analysis of a comparative such as the one shown below (cf. von Stechow (1984), Rullmann (1995), Kennedy (1997) and others):

²⁷ As pointed out to me by Danny Fox.

(76) John is taller than Bill

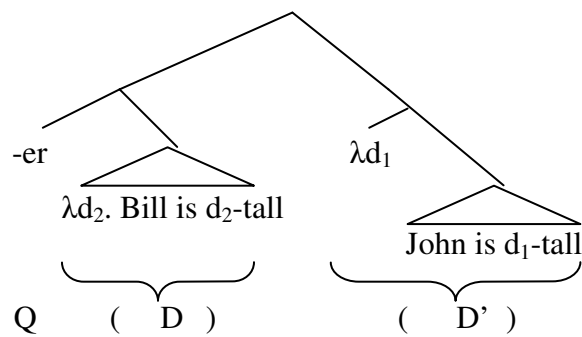
In these approaches, it is assumed that the meaning of a degree adjective and the comparative morpheme is as shown below:

(77) $[[\text{tall}]] = \lambda d_d. \lambda x_e. x\text{'s height} \geq d$ (or $[[\text{tall}]] = \lambda d_d. \lambda x_e. x\text{'s height} = d$)

(78) $[-\text{er}] = \lambda D_{\langle d, t \rangle}. \lambda D'_{\langle d, t \rangle}. \max(D') > \max(D)$

As defined above, the comparative morpheme is a generalized quantifier that establishes a relation between two sets of degrees. In our example, it states that the maximal degree in the set of degrees such that John is tall to at least that degree exceeds the maximal degree in the set of degrees such that Bill is tall to at least that degree. Compositionally the two sets of degrees are derived by a series of movements, the result of which is as shown below:

(79)



Now we are in the position to see why the sentence in (75) is a problem: According to the meaning of *tall* in (77) the maximal degree in the set of degrees such that every girl is at least that tall will pick out the height of the shortest girl:

(80) $\text{Max}(\lambda d. \text{every girl's height} \geq d)$ $\sim \rightarrow$ the height of the shortest girl

However the meaning of the sentence in (75) seems to require that John be taller than the highest girl. The (only) two recent solutions to this problem, Schwarzschild and

Wilkinson (2002), Schwarzschild (2004), Heim (2006) propose²⁸ that adjectives denote relations between individuals and intervals (sets of degrees) as shown in 0, instead of the more traditional assumption according to which adjectives denote a relation between individuals and degrees:

(81) The analyses of Schwarzschild and Wilkinson (2002), Heim (2006):

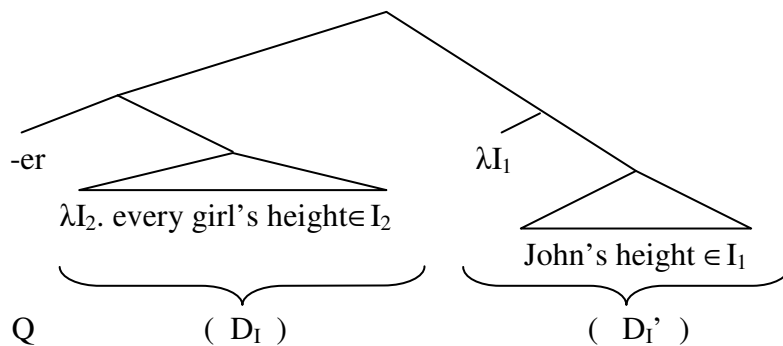
$$\llbracket \text{tall} \rrbracket = \lambda I_{\langle d, t \rangle} . \lambda x_e . x \text{'s height} \in I$$

Do we need to talk about intervals, or just sets of degrees? I will depart from Heim (2006) and follow Schwarzschild and Wilkinson (2002) in assuming that intervalhood (as opposed to mere sets of degrees) plays a role, and adopt the version according to which the sets of degrees in question in fact correspond to intervals²⁹. Given this assumption, a sentence such as *John is tall* will denote the following:

- (82) a. $\llbracket \text{John is I-tall} \rrbracket = 1$ iff John's height $\in I$; *where I is an interval*:
 b. A set of degrees D is an interval iff
 For all d, d', d'': if $d \in D$ & $d'' \in D$ & $d \leq d' \leq d''$, then $d' \in D$

Accordingly, the comparative quantifier will establish a relation between two sets of intervals, as illustrated below:

(83)



²⁸ This is a simplification of the actual proposals in Heim (2006), and Schwarzschild (2004), as we will see.

The meaning for the comparative quantifier is now defined as follows:

$$(84) \quad \llbracket \text{-er} \rrbracket = \lambda D_{I \langle d, dt \rangle} . \lambda D_{I' \langle d, dt \rangle} . [\mu I [\mu K . K < I] \in D_I] \in D_{I'}$$

where

- a. $K < I$ iff $\forall d' : d' \in K$ and $\forall d'' : d'' \in I . [d' < d'']$ (= *K is wholly below I*)
- b. $\mu I . \phi I := \iota I . \forall I' [I' \neq 0 \wedge I' \subseteq I \rightarrow \phi(I')] \wedge \forall I'' [I \subset I'' \rightarrow \exists I' \neq 0 \wedge I' \subseteq I'' \wedge \neg \phi(I')]$
(picks out the smallest interval with respect to ϕ)

Given such employment of intervals, the previously problematic example in (75) now is predicted to have the meaning we observe, and only that meaning: This is because the comparative interval now will be the smallest interval that covers all the girl's heights. If, e.g. Mary, Sue and Jane are the girls in our domain, and they are 5; 5.5 and 6 ft tall respectively, then the maximal interval that includes all of their heights is [5,6].

- (85) a. μI (every girl's height is in I) $\sim \rightarrow$ the smallest interval that covers all the girls's height
- b. 0 ----- $[d_{M,5} \text{---} d_{S,5.5} \text{---} d_{J,6}]$ ----- \rightarrow

3.2.2 The Analysis

Positive degree questions First let's look at a positive degree question, such as (51) below. Recall the assumption that we are looking for the most informative true proposition among the question alternatives. The alternative propositions in this case range over different intervals that could be the argument of the adjective:

$$(86) \quad \llbracket \text{How tall is John?} \rrbracket^w$$

$$= \lambda p . \exists I [I \in D_I \wedge p = \lambda w' . \text{John's height} \in I \text{ in } w']$$

'For what interval I , John's height is in I ?'

²⁹ But cf. Sauerland (2007) who points out a problem for this view.

Naturally, there are many intervals for which it is true that John's height (a point) is contained in them. These intervals overlap. I will say that an interval K covers interval I, if for every degree d that is an element of I, K contains that element. (In other words, I is a subset of K.) It is easy to see then that the truth of *John's height* $\in I$, will entail the truth of *John's height* $\in K$, for every K that covers I.

(87) an interval I is covered by interval K iff
for all d: $d \in I$ then $d \in K$

(88) $\langle \dots \{ \dots [d_j]_{I_1} \dots \}_{I_2} \dots \}_{I_3} \dots \}_{I_4} \dots \rangle$

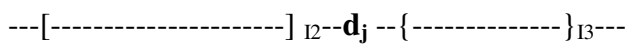
Therefore the most informative answer will be the interval {John's height}. This is illustrated in the picture above where John's height is represented by d_j . The truth of *John's height* $\in I_1$, entails the truth of *John's height* $\in I_2$ and so on. Now, when we are looking for the most informative answer among the true answers, this will be the smallest interval such that John's height is contained in it. We take it to be a fact of the world that John has some height, therefore there will always be a most informative proposition among the true propositions: that *John's height* $\in \{d_j\}$.

Negative degree questions In the case of a negative degree question the situation is different: we are now looking for the maximal interval among the intervals in which John's height is not contained. Given that the entailment pattern is reversed because of negation, if K covers I, the truth of *John's height* $\notin K$ will entail the truth of *John's height* $\notin I$. We are then looking for the biggest interval such that John's height is not contained in it. The problem is that there is no such interval.

(89) $[[*How tall isn't John?]]^w =$
 $= \lambda p. \exists I [I \in D_I \wedge p = \lambda w'. \neg \text{John's height} \in I \text{ in } w']$
 'For what interval I, John's height is not in I?'

The reason why there cannot be such an interval is because intervals are always convex. The intuitive idea can be illustrated as follows: In the picture below for example the interval I_2 is wholly below d_j , while the interval I_3 is wholly above d_j . There is no maximal interval that covers both of these intervals, but does not cover d_j .

(90) an interval I is wholly below d iff
for all d' : $d' \in I \implies d' \leq d$

(91)  ---[-----] I_2 -- d_j -- {-----} I_3 ---

More precisely, we reason as follows: Let John's height be any non-zero degree d . The set of all intervals that do not include John's height ($=N$) contains exactly two exclusive sets of intervals: all the intervals wholly below d , contained in $[0, d)$ ($=A$) and all the intervals wholly above d , contained in (d, ∞) ($=B$). It is easy to see that for any interval I included in A , the (true) proposition that John's height is not in I , does not entail that John's height is not in B , and vice versa. Hence, there is no interval I in N such that the true proposition that John's height is not in I entails all the true propositions of the same form in N . Dayal's (1996) condition cannot be met, and we predict a presupposition failure.

As long as John has any height in the actual world this situation is in fact unavoidable. Indeed it seems to be a presupposition of degree questions that the answer is not-zero. In the case of asking about John's height this is a trivial fact about the world. In the case of a question such as *How many apples did you eat?* if no apples were eaten, then a natural answer is the refutation of the presupposition: "I did not eat any apples" instead of rather odd "#Zero".

Notice that for the reasoning outlined above contextually given levels of granularity do not make any difference: any level of granularity will lead to a contradiction, as long as the domain of degrees contains at least 3 degrees. This is in contrast with Fox and Hackl (2005)'s account, who need to assume that scales are universally dense.

Modal obviation

(a) $\neg > \exists, \forall > \neg$

As we have seen above, certain quantifiers can rescue negative degree questions. Why should this be? The reason is that now there can be scenarios in which it is possible to find a most informative true answer. Let's take a question such as the one below:

(92) How much radiation are we not allowed to expose our workers to?

The fact that this question should be grammatical is straightforwardly predicted by the present account: While with respect to (49) it was a fact about the world that John's height is a single degree, the degrees of radiation that we allow our workers to be exposed to might correspond to an interval, e.g. $(0, d]$. Then any interval I wholly above d is such that is not allowed the the amount of radiation that we expose our workers to be in I . The strongest true proposition of this form is obtained by taking $I = (d, \infty)$. Therefore Dayal (1996)'s condition can be met. Another scenario in which the question might have a most informative answer is a scenario in which the degrees of radiation that we allow our workers to be exposed to corresponds to the intervals $(0, d_1)$ and (d_2, ∞) , with $d_1 < d_2$. Then there will be a most informative true proposition in the H/K denotation: namely that we are not allowed to expose our workers to $I = [d_1, d_2]$ radiation.

(b) $\neg > \forall, \exists > \neg$

(93) a. # How fast are we allowed not to drive?

b. For what I , it is allowed that our speed be not in I ?

(94) a. # How fast are we not required to drive?

b. For what I , it is not required that our speed be in I ?

Suppose we have *some* obligations as to what our speed should be. Call S the set of all the speeds such that our speed should be one of them. Then for any subset of S , it is

allowed that our speed is not in it. Also, for any subset of the complement of S, it is allowed that our speed is not in it. The interval which covers all the intervals such that our speed is allowed not to be in it is therefore $(0, \infty)$. However this interval cannot be the most informative true answer, because it will also cover the interval (or sets of intervals³⁰) for which it is required that our speed be in it.

Let's illustrate this reasoning intuitively with the following analogous example:

(95) \llbracket *How tall are you not required to be (to be a basketball player)? \rrbracket

$= \lambda p. \exists I [I \in D_I \wedge p = \lambda w'. \neg \forall w''_{Acc(w', w'')} \text{ [your height} \in I \text{ in } w'']]$

'For what interval I, your height is not required to be in that interval?'

Suppose that in the actual world namely you are required to be at least 180cm to be a basketball player, let's name this interval K. Let's take two intervals, for which it is true that it is not the case that your height is required to be in that interval: I_1 and I_2 , such that I_1 is wholly below K, while I_2 is covered by K:

(96) $--\langle \{ \text{-----} \}_{I_1} \text{-----} [d_{180cm} \text{-----} (\text{-----} \infty)_{I_2}]_K \rangle_N$

An interval that covers both of these intervals (let's name it N) is not an interval for which it is not true that in every accessible world your height is contained in this interval. Quite the opposite, in fact in every accessible world, your height will be contained in N. Now again, similarly to the basic cases, we run into a situation such that among the set of true answers there is no maximally true one, one that would entail all and only the other true answers.

³⁰ But notice that if the set S is not a convex interval, then the questions should be infelicitous independently, because it would entail that there is a degree d such that our speed is required to be both below and above it, which is impossible.

Universal modals

Let's look at positive degree questions that contain a universal modal, such as the question in (73) above. We have seen that for the earlier version of this analysis the questions with a universal modal such as *require* constituted a problem. However, now that problem disappears. Recall what the problematic question was:

- (97) \llbracket How tall are you required to be (to be a basketball player)? \rrbracket^w
 $= \lambda p. \exists I [I \in D_I \wedge p = \lambda w'. \forall w''_{\text{Acc}(w', w'')} [\text{your height} \in I \text{ in } w'']]$
 'For what interval I, your height is required to be in that interval?'

The problem was that it seemed possible to answer "at least 180cm", but this was predicted to be impossible by that proposal. Now however the situation is different: Suppose the fact is that you indeed have to be more than 180cm to be a basketball player. Then the smallest interval such that it is true that your height has to be in that interval, is the interval K: [180, ∞). For any interval that is properly contained in this interval it is not true that your height has to be in that interval. For example for the interval [185, ∞) it is not true that your height has to be in that interval to be a basketball player, since in fact you might as well be 183 and a happy basketball player. For any interval that properly contains K, it will be true that your height is required to be in that interval, but these will be less informative. Given that that the interval [180, ∞) is the smallest interval such that your height is required to be in it, the proposition that your height is required to be in the interval [180, ∞) will be the most informative proposition in this case.

- (98) -----{-----[d_{180cm}----- ∞]_K}

3.2.3. A potential problem?

Danny Fox (pc) has raised the following objection. Suppose you have to drive faster than 40m/h, but less than 70m/h. Now suppose someone asks:

- (99) How fast must you drive?

It would seem that it is possible to answer: *(at least) 40m/h*. Why is it that we do not have to say “between 40 and 70 m/h”?

We could perhaps say that this objection could be addressed by saying that in fact all that is happening here is that domain restriction is at play³¹. If we assume that it is common ground that you are not allowed to drive faster than 70m/h, then it is possible to assume that the hearer takes this fact as natural domain restriction. Then given this domain restriction “at least 40” will be de facto interpreted as ‘between 40 and 70’. One might still ask why is it that the answer “40” might mean ‘at least 40’, while in the same context, an answer such as “70” cannot be understood as “70 or less (up to 40)”. One way to address this objection could be by resorting to the assumption that was introduced above, according to which numeral expressions might denote intervals such as $[x,x]$ or $[x,\infty)$, but not intervals of the form $(0,x]$. Our opponent might still strike back pointing out that if we ask a question such as the one in (100), in the same context as was introduced above, the preferred reading of the answer “70” is in fact ‘70 or less’, in other words the numeral in this case should be able to denote an interval of the form $(0,x]$.

(100) How slow must you drive?

As it seems difficult to maneuver out of this corner, we might then try to address the objection in a different, more technical way. [This was suggested to me by Benjamin Spector (pc)]. This version would say that what we are observing in this case is that the Π -operator of Schwarzschild (2004) and Heim (2006) can take different scopes. But at this point we need to introduce some more background.

As we have said before, the above authors argue that degree adjectives should be thought of as relations between individuals and sets of degrees (intervals). But is this meaning basic or is it derived from something else? Schwarzschild (2004) and Heim (2006) argue that in fact it is derived by an invisible operator called the Π operator. More precisely, the meaning of a degree adjective such as *fast* is both (101) or (102), but the

³¹ Thanks to Gennaro Chierchia for discussion on this.

second one is more basic: we can derive (101) from (102) via composing the adjective root with an invisible Π operator:

$$(101) \quad \llbracket \text{fast}_1 \rrbracket = \lambda D_{\langle d, t \rangle}. \lambda x_e. x \text{'s speed} \in D$$

$$(102) \quad \llbracket \text{fast}_2 \rrbracket = \lambda d. \lambda x_e. x \text{'s speed} \geq d$$

$$(103) \quad \llbracket \Pi \rrbracket = \lambda D_{\langle d, t \rangle}. \lambda P_{\langle d, t \rangle}. \max(P) \in D$$

It seems harmless to reverse the order of arguments of the Π operator: so let's do it: (I have also switched back to intervals from Heim (2006)'s formulation):

$$(104) \quad \llbracket \Pi \rrbracket = \lambda P_{\langle d, t \rangle}. \lambda I_{\langle d, t \rangle}. \max(P) \in I$$

Given this, now we can say that a question such as *How tall is John?* has the following meaning (Crucially for the present account, the presence of the Π operator is not optional, but obligatory. Notice also that in this part I use the set notation for better readability):

$$\begin{aligned} (105) \quad & \llbracket \text{How fast is John?} \rrbracket \\ & = \text{'for what } I. I \llbracket \Pi. \lambda d \text{ John is } d\text{-fast} \rrbracket \text{'?} \\ & = \{ \llbracket \Pi. \lambda d \text{ John is } d\text{-fast} \rrbracket(I) \mid I \in D_I \} \\ & = \{ \max(\lambda d. \text{John is } d\text{-fast}) \in I \mid I \in D_I \} \end{aligned}$$

Now, inspired by Heim (2006)'s treatment of examples such as *He is faster than he needs to be*, we can say that Π could scope above or below *require*. Suppose now that in fact John is required to be between 160 and 180 cm. Then we have the two possibilities as shown below:

(106) [[How fast is John required to be?]]

(a)

= ‘for what interval I is it required I [Π . λd John is d-fast]’

= {it is required that $\max(\lambda d. \text{John is d-fast}) \in I \mid I \in D_I$ }

the speed of John

or:

(b)

= ‘for what interval I .D [Π . λd it is required that John is d-fast]’

= { $\max(\lambda d. \text{It is required that John is d-fast}) \in I \mid I \in D_I$ }

the speed that John is required to be at least that fast

The construal on which the Π operator has narrow scope in (106)a is equivalent to the type of reading that we have seen in (97) above. On the other hand, the construal on which the Π operator has wide scope in (106)b corresponds to the reading that the example by Fox seems to have. This is because in this case now we are looking for the interval, which contains the height such that John is required to be at least that tall, and which is also the most informative such interval. In our case, this interval will be the singleton set {160}.

It seems that this proposal stands a better chance against the objection raised in connection with *slow* before in (100). This is because now one of the predicted readings of this sentence is as shown below:

(107) [[How slow are you required to drive?]]

= { $\max(\lambda d. \text{It is required that you drive d-slow}) \in I \mid I \in D_I$ }

the speed that you are required to drive at least that slow

This now in fact correctly picks out the upper end of interval [40,70].

As it is, this proposal predicts a flat ambiguity. In the cases reviewed above this ambiguity seems to be needed. For example the question in (99) in the context described

above, might indeed be saliently answered both by $[40,70]$, or $[40,\infty)$. On the other hand, it is interesting to observe that sometimes it seems that it is not the case that both readings are equally available. Imagine the following scenario³²: I am driving 120 m/h in my Ferrari, when a policeman stops me. I innocently ask:

(108) Why did you stop me? How fast must I drive?

It seems that the above question is funny. The reason for this is that it seems to suggest that the problem might be I was not driving fast enough. But this means that the reading of the type exemplified in (106)a is for some reason not easily available here. At the moment I do not have a good explanation as to why this should be the case.

3.2.4. Kroch-examples

A nice aspect of the present proposal is that the granularity of the scales involved does not play any role: the scale might be dense (as in the case of heights, e.g.) or discreet (as in the case of children), the ungrammaticality of negative degree questions is equally predicted. As a consequence, we do not need to impose any restrictions on how the context can interact with the module of grammar that is sensitive to contradictions. In fact the felicity condition on questions introduced in the previous chapter can simply apply at the level of truth conditions.

Let's return here briefly to some of the properties of negative degree questions that were introduced in the introductory section. Recall the examples based on Kroch (1989) that showed that an explicit choice of answers seemed to make the question acceptable:

(109) Among the following, how many points did Iverson not score?

A. 20 B.30 C.40 D.50

Notice that a felicitous answer “B” seems to imply that there were many events of Iverson scoring. The Answer “b” suggests that among the alternatives given, B is the

³² This example is due to Giorgio Magri (pc).

only one to which no scoring event corresponds. Thus what is happening in these examples is not so much that the quantificational domain gets restricted, but rather that the choice of alternatives invokes a number of different events. Once the scorings can be distributed over various events, the contradiction disappears, much in the same way as in the case of modals and other quantifiers. This example thus also points in the direction of the fact that was also observed with the examples where the presence of a quantifier seemed to obviate the weak island effect. A felicitous answer to these examples seemed to imply the truth of a range of alternatives. In fact if different alternative events are not easily available, even a restricted question of the sort shown above seems to be odd:

- (110) #Among the following, how many children don't you have?
A. 2 B.3 C.4 D.5

This fact is straightforwardly predicted by the present account, but not by any other account. It also points to why the explanation of the Kroch-examples for manner questions and degree questions should be different. In the case of manner questions if there was an explicit list, it was possible for multiple manners to describe the same event, as long as they were not contraries. However that option is not available here, and therefore only a multiple event reading is available.

3.3 Interim summary of negative degree questions

In this section I have shown that an interval-based semantics for degrees predicts that negative degree questions will not have a maximal answer. This was because in these cases there was no single interval that covered all and only the degrees for which the negative predicate was true. As a consequence, any complete answer to negative degree questions amounts to a statement of a contradiction.

4 Negative island-like phenomena based on the same logic

In this section, I return to the examples mentioned in the introduction of this chapter, the oddness of which can be explained by the same reasoning as we have seen for the manner questions.

4.1 *When*

As the examples below show, we observe marked ungrammaticality with final punctual eventive verbs (e.g. *die*), but not with statives (e.g. *be happy*).

(111) *When did Mary not die?

(112) When didn't you feel happy?

It also seems that there is a scale of acceptability judgements in between these two extremes. These facts can be explained by the same logic as we have seen above: given that dying is a point-like event, there are infinite points in time (or intervals) such that it is true that Mary did not die at these times. However, these propositions are not ordered by entailment and therefore there is no maximally informative alternative among these true propositions. With statives on the other hand, it is possible to construct a scenario such that there is one maximal interval at which you did not feel happy.

4.2 *Where*

A very similar pattern can be seen with questions formed by *where*. The first example below is deviant because it is not possible given the normal laws of our world to be at more than one place at the same time: yet this is exactly what a maximal answer to this(113) question would require.

(113) *Where aren't you at the moment?

(114) Where hasn't Bill looked for the keys?

Assuming that spacial locations are point-like, there is no entailment relationship between being at various places at any given time, in fact all these options are mutually exclusive. Given this, and that there are always infinite points in space where one is not at any given moment, there is no maximally informative answer to a question like (113). On the other hand, it is perfectly possible for someone to have searched for the keys at every salient place, except for one or two locations.

5. Symmetry

This last section of the present chapter proposes that the property of having symmetric alternatives might be extended as a generalization for all cases where exhaustification leads to contradiction. Let's first state the symmetry generalization:

(115) *Symmetry*

Let p be a proposition and A a set of propositions. For any p , there are at least 2 alternatives in A such that each of them can be denied consistently with p , but the denial of both of these alternatives is inconsistent with p .

5.1 Symmetry and negative islands

Let's see informally how symmetry is manifested in the case of the interval-based analysis of negative degree questions. Suppose there was an answer to (49)a, the interval K ; $[3, \infty)$. Exhaustifying this answer would imply that for all the intervals that are not subintervals of K , the (exact) number of apples John has is contained in those intervals. The intervals $[0, 1]$ and the intervals $[2, \infty)$ are for example such intervals. However, they do not overlap, therefore it is impossible that the exact number of apples that John has be contained in both of these. In other words, the simultaneous denial of the two alternatives that *the number of apples John has is $\notin [0, 1]$* and that *The number of apples that John has is $\notin [2, \infty)$* is inconsistent. Such a situation will always arise as long as John has any apples, which in turn seems to be a presupposition of the question, as it was discussed above.

Now let's observe how symmetry is manifested in my proposal of negative manner questions. Recall the basic case of a negative manner question. Let's assume for the sake of simplicity that that the context restricts the domain to the dimension of politeness:

- (116) a. *How didn't John behave?
b. $\lambda p. \exists q_{\text{manner}} [p = \lambda w'. \text{behave}(w')(e^*)(\text{John}) \wedge \neg q_{\text{manner}}(w')(e^*)]$
c. {that John did not behave wisely,
that John did not behave unwisely,
that John did not behave neither wisely nor unwisely}

We can see that each alternative to any proposition p in the Hamblin denotation can be denied consistently with p . However, as we have seen above, the denial of any two alternatives at the same time leads to a contradiction.

5.2. Density vs. symmetry

Fox and Hackl (2005) propose that the account in terms of density that they offer for negative degree questions [reviewed in Chapter 2 of this thesis] also explains certain cases of missing implicatures such as the one below:

(117) John has more than 2 children

*Implicature: John has exactly 3 children

Without the density assumption, it seems that the implicature should be there: Among the scalar alternatives to (117) *John has more than n_{card} children*, the alternative that John has more than 3 children is the strongest. The negation of this alternative, together with the assertion of the sentence should convey that John has exactly 3 children. Given the density assumption, the predicted implicature is not present, because as a consequence of the density assumption, *more than 2* is an open interval, there can be no strongest alternative among the scalar alternatives to (117). Importantly, the pattern of modal obviation is exactly as it was observed with the cases of negative islands above. I refer the reader for the details of the explanation to their paper. It is important to note however, that Fox (2007) observes that the same pattern of behavior is observed with certain disjunctions as with the cases that Fox and Hackl (2005) explain with the UDM. As he notes, the account based on density does not extend to these examples:

(118) John has 3 or more children

*Implicature: John has exactly 3 children

Spector (2005) however argues that (118) is strengthened to:

(119) John has [exactly 3] or more children

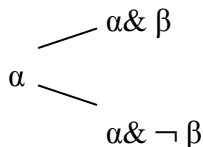
Given this, the assertion in (118) together with its primary implicatures will look as follows to the hearer:

(120) $B_s(\text{Ex}3 \vee \text{more}) \ \& \ \neg B_s(\text{Ex}3) \ \& \ \neg B_s(\text{more than } 3)$

This however cannot be strengthened to (121), because that is a contradiction. Thus, secondary implicatures cannot be computed in this case, and the hearer cannot assume that the speaker is opinionated, hence the putative implicature will not arise

(121) # $B_s(\text{Ex}3 \vee \text{more}) \ \& \ B_s(\neg \text{Ex}3) \ \& \ B_s(\neg \text{more than } 3)$

More generally the symmetry arises when there are two alternatives to an assertion α that are both stronger than α and could be excluded independently, yet the exclusion of both leads to a contradiction. One such scenario is exemplified below:

(122) α 

In such situations, the assertion cannot be strengthened. Spector (2005) further goes on to argue that in fact the example in (117) can be also reduced to the above reasoning, if we assume that the alternatives to *more than 2* should be {more than 3, exactly 3}.

Fox (2007) notes then that whatever the best explanation of (117) might be, it still seems that density is needed for the cases of negative island violations that we have seen above, while symmetry is at play in the case of (118). But given that these two sets of data seem to exhibit the same modal obviation patterns, he argues that a common generalization that subsumes both of these explanations is called for. He then indeed proceeds to provide such a generalization about the cases where exhaustification is not possible:

(123) Fox (2007)'s generalization

Let p be a proposition and A a set of propositions. p is *non-exhaustifiable* given A : $[NE(p)(A)]$ if the denial of all alternatives in A that are not entailed by p is inconsistent with p .

$$(i) [NE(p)(A)] \Leftrightarrow p \& \cap \{ \neg q : q \in A \ \& \ \neg(p \Rightarrow q) \} = \emptyset.$$

$$\Leftrightarrow \forall w \text{MAX}_{\text{inf}}(A)(w) \neq p$$

He proves that obviation by a universal, but not by existential quantification is a trivial logical property of such sets:

(124) A universal modal eliminates Non-exhaustifiability:

If p is consistent, $NE(\Box p, (\Box A))$ does not hold (even if $NE(p, A)$ holds)

(where $\Box A = \{ \Box p : p \in A \}$)

Proof: Let the modal base for \Box in w^0 be $\{ w : p(w) = 1 \}$. It is easy to see that for every $q \in A$, s.t., q is not entailed by p , there is a world in the modal base that falsifies q .

(125) An existential modal does not eliminate Non-Exhaustifiability:

if $NE(p, A)$ holds, so does $NE(\Diamond p, \Diamond A)$ (where $\Diamond A = \{ \Diamond p : p \in A \}$)

Proof: Assume otherwise, and let MB be the modal base that satisfies $\Diamond p$ but does not satisfy any of the propositions in $\Diamond A$ not entailed by $\Diamond p$ (i.e. any of the proposition $\Diamond q$ in $\Diamond A$ such that q is not entailed by p). Since $\Diamond p$ is true, $\exists w \in MB$, s.t. $p(w) = 1$, w_p . For each $q \in A$, such that p does not entail q , $q(w_p) = 0$ since $[\neg \Diamond q](w) = 1$. But this means that all non-entailed members of A could be denied consistently, contrary to assumption.

The generalization about the NE sets of propositions subsumes both the cases of symmetry and the cases of density. Thus the observed pattern of modal obviation has a principled explanation in our system based on Fox (2007).

However, one question one might ask, whether we really need anything else than symmetry? If the analysis of *degree/manner* questions proposed in this chapter is on the right track then we might be able to retain a more restrictive generalization than that of Fox (2007), and reduce all cases of non-exhaustifiability to the property of having symmetric alternatives—modulo the problems cited in Fox (2007) for Spector (2005)'s account. An advantage of the treatment in terms of symmetrical alternatives is that it extends to presupposition islands, and other weak island violations—Which is the topic of the next chapters.

Chapter 4

Presuppositional Islands

1. Introduction

In the previous chapter we have seen that in the case of manner and degree questions that contained negation, the statement for any answer that it is the complete answer resulted in the statement of a contradiction. In this chapter we look at islands created by presuppositional items, such as islands created by factive verbs and extraposition, as well as islands created by adverbs of quantification and *only*, which I will argue in fact belong to the same group. I will show that similarly to the case of negative islands, the reason for the unacceptability of these questions is that they lead to a contradiction: albeit at a different level. In these cases the contradiction arises at the level of presuppositions of the question. For easier reference, let's list the group of interveners to be discussed in this chapter here:

Factive verbs:

- (1) a. Who did John regret that he invited to the party?
- b. *How did John regret that he behaved at the party?
- c. *How much milk does John regret that he spilled?

Extraposition:

- (2) a. Who was it scandalous that John invited to the party?
- b. *How was it scandalous that John behaved at the party?
- c. *How much milk was it a surprise that John spilled on his shirt?

Adverbs of quantification:

- (3) a. Who did you invite a lot?
b. *How did you behave a lot?
c. *How much milk did you drink a lot?

Only NP:

- (4) a. Who did only John invite to the party?
b. ??How did only John behave at the party?
c. *How much milk did only John spill?

What the above interveners have in common is that they presuppose (that someone believes) the truth of their complement. As I will argue in this chapter, there are reasons to believe that questions that contain a variable (a *wh*-trace) in the scope of the presuppositional item will stand with a set of presuppositions: the presuppositions of all the propositional alternatives in the H/K denotation. However, as this set of presuppositions turns out to be contradictory in the case of certain manner and degree questions. A set of contradictory presuppositions has the unpleasant consequence that the sentence is unassertable in any context: this is because there is no context in which all the presuppositions can be satisfied. Why will this set be contradictory? In a sense the issue is the mirror image of the problem of symmetric alternatives that we have seen before. In the previous chapter it seemed that the problem was caused by the fact that there were always two alternatives among the set of alternatives that had to be ruled out, yet could not be ruled out at the same time. Now, there will always be two alternatives that are mutually incompatible, and yet will both have to be part of the set of presuppositions of the question. But since no context can entail two mutually exclusive propositions, there will never be a context in which an answer to manner or degree questions containing the above mentioned presuppositional items can be asserted³³. The exception to this generalization will come from so called D-linked readings of manner questions, as well as wide scope readings of *how-many* questions, which are not predicted to lead to a

³³ Similar reasoning about contradictory presuppositions leading to ungrammaticality was proposed in Heim (1984), Krifka (1995), Zucchi (1995), Lahiri (1998), Guerzoni (2003), Abels (2004), Abrusan (2007).

contradiction. This, as I will show, is a welcome result since these examples are famous (or notorious) for being acceptable, despite the factive/presuppositional context. I will also show that in the case of questions about individuals, as the alternative propositions are independent from each other, no problem is predicted to arise.

Let's look now at these claims in more detail. In Section 2 I will present some evidence that presuppositions in questions project in a universal manner. Section 3 spells out the core of the analysis, concentrating on factive verbs like *regret*. Section 4 deals with the possibilities of extending the account proposed for factive verbs to other interveners, such as part-time triggers, response stance verbs, and extraposition islands. The final section takes a closer look at intervention caused by *only NPs*, and argues that these too belong to the group of presuppositional interveners.

2. Presuppositions of questions

In this section I will observe that questions which contain a variable in the scope of a factive item are naturally understood in a way which suggests that their presupposition projects in a universal manner. I will also discuss certain apparent counterexamples to this generalization, and argue that in these cases we are in fact dealing with a special type of identity questions, in the case of which the presupposition projected is simply invariant. For these questions, the universal pattern in fact makes the same predictions as an existential pattern would make: the presupposition projected is simply invariant.

2.1 Sets of partial propositions

The sentence in (5) triggers the presupposition that Bill is lucky:

(5) John knows that Bill is lucky

Intuitively this means that the participants in the conversation are likely to take it for granted that Bill is lucky ([Stalnaker, 1974 #193], [Karttunen, 1974 #194]). Following Stalnaker the context is usually taken to be the set of possible worlds in which all the propositions that are taken to be true by the participants of the conversation (i.e. the

common ground) are true. More precisely then we can say that the utterance of (5) requires that the context entail that Bill is lucky.

I will assume as usual that the presupposition of the sentence above is triggered by the factive verb *know*. Similarly to Frege's treatment of the definite determiner (cf. discussion and modern implementation in Heim and Kratzer (1998)) I will treat the presupposition as a definedness condition on the hosting sentence. The predicate *know* denotes a partial function, as shown in the lexical entry below:

$$(6) \quad \llbracket \text{know} \rrbracket = \lambda P. \lambda x. \lambda w: \underline{P(w)=1}. \text{knows}(x)(P)(w)$$

The compositional rules³⁴ (cf. Heim and Kratzer (1998), Guerzoni (2003)) ensure that the definedness condition in the lexical entry (underlined above) projects to become the definedness condition of the whole sentence.

$$(7) \quad \llbracket \text{John knows that Bill is lucky} \rrbracket =$$

$$\lambda w: \underline{\text{Bill is lucky in } w}. \text{John knows that Bill is lucky in } w$$

What happens if we form a question based on a sentence that contains a presupposition trigger such as *know*? Now the H/K denotation of the question contains a set of partial propositions, as shown below.

$$(8) \quad \llbracket \text{Who knows that Bill is lucky?} \rrbracket^w =$$

$$\lambda p. \exists x [\text{person}(x) \ \& \ p = \lambda w': \underline{\text{Bill is lucky in } w'}. \text{John knows that Bill is lucky in } w']$$

³⁴ As discussed in Guerzoni (2003), what we need is a slightly revised version of Heim and Kratzer (1998)'s Intensional Function Application Rule:

(1) *Intensional Function Application revised (IFA*)*

If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters then for any possible word w and assignment function g , $\alpha \in \text{dom}(\llbracket \]^{w,g})$ if $\beta \in \text{dom}(\llbracket \]^{w,g})$ and if $\llbracket \beta \rrbracket^{w,g}$ is a function whose domain contains $\lambda w': \gamma \in \text{dom}(\llbracket \]^{w',g})$, then $\llbracket \alpha \rrbracket^{w,g} = \llbracket \beta \rrbracket^{w,g} (\lambda w': \gamma \in \text{dom}(\llbracket \]^{w',g}). \llbracket \gamma \rrbracket^{w',g})$

Empirically it seems clear that the question retains the presupposition of its declarative counterparts, in other words (8) presupposes that Bill is lucky. In fact the persistence of presuppositions in questions is usually taken to be one of the most reliable diagnostics for determining whether the meaning of an expression is presuppositional. The compositional aspect of *how* presuppositions project in questions the way they do is less clear. Among the few people explicitly addressing this issue is Guerzoni (2003). She discusses two options for a compositional treatment of presupposition projection in questions, both of which predict the same outcome for the example in (8), but not necessarily in other cases. These two options can be summarized as below:

- (a) Answer based approach: If the semantic presuppositions of a presupposition trigger such as *know* are inherited as such by the possible answers to the question, the question as a whole carries a pragmatic presupposition (in the sense of Stalnaker). The question thus is semantically well-defined in any context, but might be pragmatically infelicitous.

- (b) Question based approach: A question semantically presupposes the presuppositions of its sub-constituents. Therefore the question is denotation-less in contexts where the presupposition is not satisfied.

In the case of (8) both approaches predict that the question is infelicitous unless the context entails that Bill is lucky. Here is why. In the Answer-based approach the question itself is always well defined. However, a felicity condition applies, which Guerzoni (2003) calls the *Question Bridge Principle*³⁵, modeled after Stalnaker's Bridge principle:

(9) *Question Bridge Principle* Guerzoni (2003)

A question is felicitous in context C only if it can be felicitously answered in C.

As noted in Guerzoni (2003), the output of this rule will inherit the definedness condition of the intensional functor, but not necessarily of its argument. Whether or not the definedness conditions of the argument will be inherited depends on the semantics of the functor itself.

Given this principle, the question in (8) is only felicitous if the context entails that Bill is lucky. This is because all the possible answers to (8) presuppose that Bill is lucky, therefore choosing any one of the possible answers will require that the context entail that Bill is lucky.

In the question-based approach the question as a whole inherits the definedness conditions of its constituents, therefore it will be denotation-less unless the presupposition is satisfied by the context:

- (10) $[[\text{Who knows that Bill is lucky}]]^w$ is defined iff $P(w)=1$.
- a. $P=\lambda w'. \text{Bill is lucky in } w'$.
 - b. If defined, then $[[\text{Who knows that Bill is lucky}]]^w =$
 $\lambda p.\exists x [\text{person}(x) \ \& \ \lambda w': \underline{\text{Bill is lucky in } w'}. \text{John knows that Bill is lucky in } w']$

On both approaches thus the question presupposes that Bill is lucky. But what happens if the question contains a bound variable in the scope of a factive predicate as below? Now it seems that the two approaches might yield a different result. Cf. the example below:

- (11) $[[\text{Which of your friends knows that he is lucky?}]]^w$
- $=\lambda p.\exists x [\text{your friend } (x)(w) \ \& \ p=\lambda w': \underline{x \text{ is lucky in } w'}. x \text{ knows that } x \text{ is lucky in } w']$

The Answer based approach predicts that a question denoting a set of partial propositions presupposes the disjunction of the presuppositions of these propositions. In other words, the question presupposes that at least one answer to it is felicitous. This is because the Question Bridge Principle as defined above only requires that there be at least one felicitous answer to the question³⁵. In the case of (11) this means that the question would come with the presupposition that at least one of your friends is lucky.

³⁵ A similar condition was also explored already in Belnap and Steel (1976): “A question Q presupposes a statement A iff the truth of A is a logically necessary condition for there being some true answer to Q.”

³⁶ Of course, it would have been possible to define the *Question Bridge Principle* differently: in such a way that it requires all the possible answers in the question denotation to be felicitous.

On the Question based approach a question denoting a set of partial propositions might presuppose the conjunction or the disjunction of the presuppositions of these propositions. This will depend on what we take the rule for presupposition projection in quantificational contexts to be. Most theories of presupposition projection predict that the pattern should be universal (cf. Heim (1983), and more recently Schlenker (2007)). Beaver (1996) however predicts an existential projection pattern.

The two possible approaches reviewed above seem to predict different projection patterns. Furthermore, these two approaches are of course not the only possibilities: in particular, a number of recent theories of presupposition projection (e.g. Schlenker (2007), George (2008), Chemla (2008), among others) might offer slightly different methods for handling presuppositions of questions. The pressing issue therefore is to establish what the empirical facts are that need to be predicted in the first place. In the next section I will show that in the case of questions about individuals that contain a variable in the scope of a factive verb the empirical fact seems to be that the projection pattern is universal. In the rest of the chapter then I will take this fact at face value, remaining agnostic about which projection theory in particular makes the correct predictions. Rather, the argument will go as follows: whatever the projection facts for questions about individuals that contain a factive verb turn out to be, this pattern can be expected to carry over to similar questions about manners and degrees. As projection turns out to be universal in the case of questions about individuals, it will be reasonable to assume that it is universal in the case of manner and degree questions as well.

2.2 Questions about individuals: universal projection

Let's start by examining questions about individuals containing a variable in the scope of a factive verb such as *regret*:

- (12) Who among these ten people does Mary regret that Bill invited?

Heim (1992) has argued that the factive verb *regret* triggers the following presupposition³⁷:

- (13) *x regrets that p*
presupposes: x believes that p

In other words the presupposition of *regret* requires that every belief world of the subject is such that it entails *p*. Given this, the denotation of the question above will look as follows:

- (14) $[[[(12)]]]^w = \lambda p. \exists x [x \in \{\text{these ten people}\} \ \& \ p = \lambda w': \text{Mary believes that Bill invited } x \text{ in } w']$. Mary regrets that Bill invited *x* in *w'*

Now we might ask, what does the question in (12) presuppose? Empirically, it seems that it presupposes that for every *x* in the given domain, Mary believes that Bill invited *x*:

- (15) **presupposition of (12):** $\forall x \in \{\text{these ten people}\} : \text{Mary believes that Bill invited } x$

We observe then that the projection pattern with factive verbs is universal³⁸. In the case of a question about individuals the context can easily satisfy the set of presuppositions that the question has: The presuppositions of the alternatives are independent from each

³⁷ This presupposition is weaker than what is often assumed in connection with factives, namely that the matrix context has to entail *p*. Heim (1992) however argues that such a presupposition seems in fact to be too strong for factive attitude verbs such as *regret*. (Although *know* might be an exception). Notice however that such a stronger presupposition would equally derive the contradiction that manner and degree islands show, just in an even stronger way.

³⁸ As Anna Szabolcsi (pc) pointed out to me, we find weaker presupposition projection pattern with certain predicates such as *stop smoking*:

- (1) Which of your friends has stopped smoking?

However, we might observe that predicates such as *stop smoking* are independently known to be weak triggers:

- (2) I notice you are chewing on your pencil. Have you recently stopped smoking? (example due to B. Geurts)

other. Note also that similar data about universal projection in constituent questions were observed in Guerzoni (2003)³⁹.

I believe that universal projection is also at the heart of the contrast discovered in Szabolcsi and Zwarts (1993) between questions about individuals that involve a predicate that can be iterated vs. questions that contain *one time only* predicates:

- (16) a. To whom do you regret having shown this letter?
b. *From whom do you regret having gotten this letter?

While this is not the explanation that Szabolcsi and Zwarts (1993) provide for the contrast above, observe that the difference between the two questions above can be easily explained under the assumption that indeed the projection pattern of the presuppositions is universal. Given such a pattern, the example in (16)a presupposes that you have shown the letter to a number of people—which is an unproblematic presupposition. According to the universal projection pattern, the example in (16)b will likewise presuppose that you have gotten this letter from a number of people: This condition however is impossible to meet, since *get* is a *one time only* predicate, and (on the distributive reading that we are after here) it is only possible to get a letter from a single sender. In other words, the problem with (16)b stems from the fact that it stands with a presupposition that is impossible for any context to satisfy. In section 3 I will argue that essentially the same problem is at the heart of presuppositional islands created by manner and degree extraction: these questions also stand with a presupposition that is contradictory, and therefore cannot be satisfied in any context.

³⁹ In chapter 3 of her dissertation, Guerzoni (2003) discusses the effects of minimizers and focus particles such as *even* in constituent questions. The latter are ambiguous between a biased and a neutral reading:

- (1) A. Who will lift a finger to help us?
b. Who even solved problem 2?

On the neutral reading, the question in (1)b seems to carry a “universal hard” presupposition, while on the biased reading it seems to have a “universal easy” presupposition, as described below:

- (2) a. ‘ \forall hard’ presupposition: for every contextually relevant person, having solved Problem 2 is LESS likely than solving any other problem
b. ‘ \forall easy’ presupposition: for every contextually relevant person, having solved Problem 2 is MORE likely than solving any other problem

2.3 Identity questions⁴⁰

Before moving on to the analysis of presuppositional islands, the following fact is worth pointing out in connection with examples that contain a *one time only* predicate. Interestingly, in certain cases it is possible to obviate the above effect, as shown by the example below:

(17) Who is the one that you regret having gotten this letter from?

This example is grammatical, despite the one-time only predicate contained in the question. Why should that be? I believe that what is going on in this case is the following. First observe that the question above is understood as an identity question, in other words it is concerned about the identity of a particular individual, one that is already salient in the context.

(18) a. $\lambda p. \exists x [p = \lambda w'. x = \iota y. \text{you regret that you got the letter from } y \text{ in } w']$
b. 'For what individual x , $x = \iota y$ such that you regret you got the letter from y ?'

Since the identity question contains a definite description, now in fact we have two presuppositions embedded in each other: the uniqueness presupposition of the definite description, and the factive presupposition triggered by *regret*:

(19) Who is [_{uniqueness pres} **the one** that you [_{factive pres} **regret** having gotten this letter from]]?

Moreover, we might observe that the factive presupposition trigger is in the restrictor of the definite description, as shown below:

(20) **the one** [that you _{factive pres} **regret** having gotten this letter from] is Bill

⁴⁰ Thanks to Philippe Schlenker for a helpful discussion on this issue.

However, it is an independently known fact that presuppositions embedded in restrictors of quantifiers are independently known to project weakly or not at all [cf. Schlenker (2006)]. This can be observed in examples such as the one in (21) below, which does not seem to stand with the inference that all of these ten boys are incompetent:

(21) (among these 10 boys) No one [who is **aware** that he is incompetent] applied

What seems to happen then in the case of (17) is that the factive presupposition that is embedded in the restrictor of the definite description fails to project, and it is only the uniqueness presupposition of the definite description that projects. However this presupposition is in fact invariant for all the propositions in the question:

(22) **Presupposition of (17):**

the invariant uniqueness pr: ty. you regret that you got the letter from y

Since the uniqueness presupposition is invariant, the question itself will only presuppose that there is a unique individual which you regret having gotten the letter from. This presupposition in turn can be easily satisfied in any context, and hence the question is acceptable.

3 Presuppositional islands with factive verbs

In the previous section we have seen that questions that contain a bound variable in the scope of a presupposition trigger show a universal projection pattern. This property of questions leads to a problem in the case of *one time only predicates*, because it predicted a presupposition that no context could satisfy. The problem however was obviated in the case of identity question, in the case of which the factive presupposition got trapped in the restrictor of the definite description.

This is a very interesting observation from the perspective of weak island violations with manners and degrees. The reason is that it is well known that weak islands improve if the context provides a salient “referent”, if the *wh*-phrases in question can be understood as “D-linked” in the sense of Pesetsky (1987). In this section I will show how

such a pattern can be predicted. The problem will be that in the case of manner and degree questions that contain certain presuppositional elements a universal projection pattern leads to a set of contradictory presuppositions. However, as we will see if the context provides a salient manner and therefore the manner question can be understood as an “identity” question, the projected presupposition will in fact be invariant and therefore a contradiction can be avoided. Somewhat similarly, in the case of degree questions and the narrow scope reading of numeral questions a universal projection pattern will derive a contradiction, however under the wide scope reading a contradiction will not be predicted to arise.

3.1 Questions about manners

This section examines manner questions that contain a variable in the scope of the factive verb. I will argue that given the assumptions about the domain of manners, such questions always stand with a contradictory set of presuppositions. As there can be no context that satisfies the presupposition of these questions, and hence they will always result in a presupposition failure.

Recall that in the previous chapter I have argued that the domain of manners always contains contraries. It was argued that every manner predicate has at least one contrary in the domain of manners. (23) spells out this condition on the domain of manners:

- (23) Manners denote functions from events to truth values. The set of manners (D_M) in a context C is a subset of $[\{f \mid E \rightarrow \{1,0\}\} = \wp(E)]$ such that for each predicate of manners $P \in D_M$, there is at least one contrary predicate of manners $P' \in D_M$, such that P and P' do not overlap: $P \cap P' = \emptyset$.

As I have argued, although the context might implicitly restrict the domain of manners, just as the domain of individuals, but for any manner predicate P , its contrary predicates will be alternatives to it in any context. For example any domain of manners that includes *properly* will always include its contrary (and also an ‘elsewhere’ manner, though this

will be immaterial in the present case). Some further examples of permissible domains are shown below:

- (24) a. {wisely; unwisely, etc...}
 b. {fast, slowly, etc...}
 c. {by bus, by car, etc..}

Given this simple and rather natural assumption, manner questions that contain a factive verb are predicted however to presuppose a contradiction. Let's look at the example below:

- (25) *How does Mary regret that John fixed the car?

Since the alternative propositions in the H/K denotation of the question will be always ranging over a set manners that contains contraries, a universal projection pattern for the presupposition embedded in the scope of the question will project a set of propositions that are contradictory:

- (26) $[[\text{How does Mary regret that John fixed the car?}]^w$
 $= \lambda p. \exists \alpha [\alpha \in D_M \ \& \ p = \lambda w': \text{Mary believes that John fixed the car in } \alpha \text{ in } w']$
 $\text{Mary regrets that John fixed the car in } \alpha \text{ in } w']$

- (27) *Projected presupposition of the question in (25):*
 \rightarrow for every manner $\alpha \in D_M$: Mary believes that John fixed the car in α
 \rightarrow for every manner $\alpha \in D_M$: Mary believes that John's car fixing event e^* was in α

Recall that manner questions are understood as asking about a particular event, which in this case means that the proposition embedded under the attitude verb is understood as describing a particular event e^* . However, it is not possible for a single event to be an element of all the manners in a given domain of manners, because these domains always

contain contraries, as it was argued above. Therefore it is not possible for John to have fixed the car in all the ways given in the context, and as a consequence the question in (25) will always presuppose that Mary has an incoherent set of beliefs.

Interestingly again, the island violation can be obviated in certain examples, such as the one below:

(28) What is the manner in which John regrets that Mary fixed the car?

This scenario is in fact the situation often described as D-linking, which tends to improve the acceptability of weak islands. What I would like to suggest is that in these cases again we are dealing with identity questions, the denotation of which can be represented as below:

(29) $\lambda p. \exists \alpha [\alpha \in D_M \ \& \ p = \lambda w': \alpha = \iota \beta \text{ s.t. Mary regrets that John fixed the car in } \beta \text{ in } w']$
 'For what manner α , $\alpha = \iota \beta$ such that Mary regrets that John fixed the car in β ?'

The factive presupposition is again embedded in the restrictor of the definite description

(30) *the manner* [such that Mary **regrets** that John fixed the car that way] is α

Since the projection pattern from the restrictors of quantifiers is very weak, as discussed e.g. in Schlenker (2006), the embedded factive presupposition will not project, only the presupposition of the definite description, which is invariant. Therefore the presupposition of the question is not going to be contradictory.

(31) **Presupposition of (28):** $\iota \beta$. Mary regrets that John fixed the car in β

Finally, note that the explanation for the above example remains the same for an analogous question with a resumptive NP, such as the one below:

(32) What is the manner such that John has fixed the car that way?

3.2 Degree and *how many* questions

This section examines first why degree questions that contain a factive predicate are unacceptable. Then I will turn to an analogous restriction that can be found with certain readings of *how many* questions.

3.2.1 Degree questions

Recall that in the previous chapter I have introduced the assumption that degree questions range over intervals. In other words, following the proposals advanced in Schwarzschild and Wilkinson (2002), Schwarzschild (2004) and Heim (2006) it was assumed that degree predicates denote relations between individuals and intervals (sets of degrees), as shown in (33). Given this, the meaning of a degree question will be as in (34):

$$(33) \quad \llbracket \text{tall} \rrbracket = \lambda I_{\langle d, t \rangle}. \lambda x_e. x \text{'s height} \in I$$

$$(34) \quad \llbracket \text{How tall is John?} \rrbracket^w = \lambda p. \exists I [I \in D_I \wedge p = \lambda w'. \text{John's height} \in I \text{ in } w']$$

‘For what interval I, John’s height is in I?’

Now the meaning of a degree question that contains a factive predicate can be represented as follows:

$$(35) \quad \llbracket * \text{How tall do you regret that you are?} \rrbracket^w$$

$$= \lambda p. \exists I \in D_I [p = \lambda w'. \text{regret} (\lambda w''. \text{your height} \in I \text{ in } w'') (w')]$$

‘For what interval I, you regret that your height is in I’

Observe now that any domain of degrees that has at least 2 degrees in it⁴¹ will contain two non-overlapping intervals, that can be pictured as follows.

$$(36) \quad \text{-----} [\text{-----}]_1 \text{-----} [\text{-----}]_2 \text{-----}$$

⁴¹ I assume that if a domain of degrees only has a single degree in it, the question will be infelicitous since it will always denote a tautology.

Given the universal projection pattern, the question will stand with the following presupposition:

- (37) **Presupposition** of (35): $\forall I \in D_I$: you Believe $(\lambda w'$ your height $\in I$ in $w')$ (w)
 ‘you believe your height to be contained in every interval’

However, since the domain of degree always contains two non-overlapping intervals, this presupposition amounts to requiring that the subject have a contradictory set of beliefs, because it is not possible that someone’s height be contained in two non-overlapping intervals. Since the question stands with a contradictory presupposition, it will be infelicitous in any context and hence unacceptable.

3.2.2 *How many* questions: scope ambiguity

Recall from the previous chapter that an existential noun phrase such as *n-many books* can be understood as having scope over *want* (38)a, or with a reconstructed scope under the attitude verb (38)b (Rullmann (1995), Cresti (1995), Fox (2000), Romero (1998):

- (38) How many books do you want to buy?

c. **Wide scope reading:**

‘For what interval I, there is a set of (particular), books X, $|X| \in I$,

such that you **want** to buy X’

$\lambda p. \exists I \in D_I [p = \lambda w'. \exists X [\text{book}(X)(w') \ \& \ |X| \in I \ \& \ \text{want}$

$(\lambda w''. \text{buy}(\text{you})(X)(w''))(w')]]$

d. **Narrow scope (reconstructed) reading:**

‘for what interval I, you **want** there to be a set of books X , $|X| \in I$, such that you buy X’ (i.e. What amount of books do you want to buy?)

$\lambda p. \exists I \in D_I [p = \lambda w'. \text{want} (\lambda w''. \exists X [\text{book}(X)(w'') \ \& \ |X| \in I \ \&$

$\text{buy}(\text{you})(X)(w''))]] (w')$

The two readings have been extensively discussed in Rullmann (1995), Cresti (1995), Fox (2000), Romero (1998). The first reading is somewhat reminiscent of the *de re/de dicto* ambiguity (though cf. Rullmann (1995) for a list of important differences). In the syntactic tradition, the first reading is also often called the ‘D-linked’, or ‘referential’ reading, even though the latter terminology is rather misleading, as from a semantic point of view degree questions cannot be said to be ‘referential’ in any sense. It has been long observed that the two readings behave differently in the context of weak-island inducers (cf. Longobardi (1987), Rizzi (1990), Cresti (1995, Rullmann (1995)): the narrow scope reading is sensitive to weak islands, but the wide scope reading is not. This is also true in the case of factive islands, as the example below shows:

(39) How many books do you regret that you bought?

a. **Wide scope reading:**

‘For what interval I, there is a set of (particular) books X , $|X| \in I$, such that you regret that you bought X’

$\lambda p. \exists I \in D_I [p = \lambda w'. \exists X [book(X)(w') \ \& \ |X| \in I \ \& \ \mathbf{regret} \ (\lambda w''. \text{buy} (you)(X)(w''))(w')]]$

b. **#Narrow scope (reconstructed) reading:**

‘For what interval I, you regret that the number of books that you bought is in I’

$\lambda p. \exists I \in D_I [p = \lambda w'. \mathbf{regret} \ (\lambda w''. \exists X [book(X)(w'') \ \& \ |X| \in I \ \& \ \text{buy} (you)(X)(w'')]) (w')]$

The well known observation in the literature is that in the case of (39), only reading (a) exists, but reading (b) does not. This fact receives a straightforward explanation in the present approach. Notice that in the case of the wide scope reading the variable I is not in the scope of *regret*. Therefore the presupposition of each alternative in the H/K denotation of the question under the wide-scope reading will be invariant, and the inherited presupposition of the question will be as shown below:

(40) Presupposition of the wide scope reading:

$\forall X \in D_{\text{books}}. \text{you Believe } (\lambda w'. \text{bought (you)(X)(w'))(w)$

‘you believe you bought all the books in the domain’

The presupposition of the wide-scope reading of the question says that for every set of books (in a given, contextually restricted domain) you believe you bought that set of books. This presupposition can be satisfied, if you bought all the books in a given domain. However in the case of the narrow scope reading the situation is different. As the variable I is in the scope of the factive verb *regret*, the presuppositions the alternatives in the H/K denotation of the question under the narrow scope reading will be different. A universal pattern of presupposition projection then will predict the following presupposition for the question:

(41) Presupposition of the narrow scope reading:

$\forall I \in D_I: \text{you Believe } (\lambda w'. \exists X [\text{book}(X)(w') \ \& \ |X| \in I \ \& \ \text{buy (you)(X)(w')}])(w)$

‘For every interval, you believe that the number of books you bought is in that interval’

However, this presupposition is a contradiction. This is because it is not possible that the number of books that you bought be a member of every interval, as the set of intervals in any domain will contain many non-overlapping intervals. In fact as soon as the domain of degrees has as much as two degrees in it, d_1 and d_2 , the domain of intervals will contain at least two exclusive intervals (sets of degrees): $\{d_1\}$ and $\{d_2\}$. Therefore the narrow scope reading of the question in (39) is predicted to stand with a set of contradictory presuppositions as soon as our domain contains two degrees. (If the domain only contains a single degree the question will denote a tautology). As before, a set of contradictory presuppositions means that the question cannot be stated in any context.

3.3 Interim summary

In this section I have argued that manner and degree questions that contain a factive verb will always carry the presupposition that the subject has a contradictory set of beliefs. This clearly cannot be a felicitous situation for asking a question. Given this, there is no context in which the question can be felicitously asked, and hence it will be ungrammatical. An exception to this generalization is constituted by the cases in which the manner phrase can be understood as ‘D-linked’, i.e. if there is certain salient manner in the context, though its identity might be unknown. In this case, the analysis presented above correctly predicts that the question should be acceptable. Similarly, in the case of *how-many* questions, the analysis predicts that the wide scope reading should be acceptable, but not the narrow scope one, as only the latter comes with a set of contradictory presuppositions.

4 Extensions

In the previous section it was argued that raising a manner or a degree *wh*-word from the scope of a factive verb is impossible in most cases because such questions are predicted to stand with an incoherent presupposition. This was predicted if the presuppositions of the alternatives in the H/K denotation of the question project universally, i.e. the question presupposes the conjunction of the presuppositions of its alternatives. In this section I will argue that the reasoning presented above for factive verbs can be extended to certain islands created by extraposition (4.1) and certain adverbial interveners as well as some quasi-factive verbs (part-time triggers) (4.2). I will also point out a problem that arises in the case of response stance predicates in section 4.3.

4.1 Extraposition Islands

A well known group of weak island inducers are the islands created by extraposition, such as (43) below. This group of island inducers is usually handled separately from factive islands in the literature. However it has been already observed by Honcoop (1998) that extraposition and factives should in fact belong to the same class of interveners. This is because whether or not extraposition creates weak islands depends on the factivity of the verb/noun involved in the construction. In other words, it is not so much the syntactic

properties of extraposition that play a role in their island creating behavior, rather the factive inference they may stand with. When the extraposition is based on a noun/adjective that triggers a factive inference, the extraposition creates a weak island context. However, on the occasions that extraposition is not based on an adjective that has a factive inference, it does not give rise to Weak Islands either⁴². The example in (42) below clearly stands with a factive inference that (the speaker believes that) p:

- (42) It was a surprise that John behaved politely
presupposes: (the speaker believes that) John behaved politely

Accordingly, the question based on this extraposition structure is predicted to be an island violation, which is indeed the case as shown by the example below:

- (43) *How was it a surprise that John behaved?

The reasoning of course is the same as the one presented for factive verbs in the previous section: the question is predicted presuppose the conjunction of the presuppositions of the alternatives in the H/K denotation. However, as we have seen above, this set will always contain propositions that are mutually incompatible. Hence the set of presuppositions that the question stands with will be always incoherent, therefore the question cannot be asked in any context.

In contrast, observe that certain other structures that can be classified syntactically as belonging to the class of extrapositions, do not stand with a factive inference:

- (44) a. It is possible that John behaved politely.
→does *not* presuppose that John behaved politely
b. It is dangerous for youngsters to drink wine at the party.
→does *not* presuppose that youngsters drink wine at the party.

⁴² The one exception in the literature to the above claim is the example from Cinque (1990):

(1) *How is it time to behave?
I do not have an explanation for this fact.

Correspondingly, as one can observe by looking at the examples in (45) below, such extrapositions do not induce weak islands either.

- (45) a. How is it possible that John behaved?
b. How much wine is it dangerous to drink at a party?

example (b) due to Postal, cited in Szabolcsi (2006)

The questions below are acceptable, as predicted by the present theory, because they do not stand with any conflicting presuppositions⁴³, in fact probably they do not trigger any presupposition at all.

4.2. Weak triggers

If the intervention by factive verbs and (factive) extraposition islands is indeed the result of the factive inference, we should find cases where the presence or absence of this inference correlates with the island creating behavior of the intervener. In this section I will tentatively suggest that we might indeed observe such cases. I will argue that this is the case in both with certain adverbial interveners as well as with verbs such as *tell*, which might trigger a factive-like inference in some but not other contexts. When the lexical content together with the context suggests a factive inference, we observe island inducing behavior, but not otherwise. Below I first examine adverbial interveners, and then I turn to part time triggers such as *tell*.

⁴³ In some cases we might observe that the extraposition might stand with a presupposition that is somewhat weaker than typical factive inferences: e.g. the example below presupposes that *someone* believes or has proposed the truth of the complement. It seems that in these cases as well, we might observe an island inducing behavior:

- (3) It is true that Bill behaved politely.
→presupposes: *Someone believes that Bill behaved politely*
(4) *How is it true that Bill behaved?

However, this is not a peculiarity of extraposition islands. It has been observed that verbs that stand with such a presupposition, eg. *admit* (a.k.a. response stance predicates) in fact give rise to weak islands as well as discussed in section 4.2.

4.2.1 Adverbial interveners

In this section I will propose that adverbial interveners such as *fast* or *twice* in fact provide examples of cases where the presence or absence of the factive inference correlates with the island creating behavior of the intervener. In other words, I would like to propose that adverbial interveners in fact belong to the group of presuppositional islands. This is in contrast with most (indeed, all) of the literature on this topic, who claim that (quantificational) adverbial interveners argue for treating weak island intervention in terms of scope (e.g. Kiss (1993), de Swart (1992), Szabolcsi and Zwarts (1993), Honcoop (1998)). However, I believe that rather than scope restrictions, the real culprit is again presuppositions. Linebarger (1981), and more recently Simons (2001) and Schlenker (2006a) note that adverbs give rise to “quasi-presuppositions”, i.e. in some circumstances they create inferences that project in a presupposition-like fashion:

- (46) Bill ran fast
→Inference: Bill ran

The projection properties of this inference seem to pattern with that of real presuppositions, at least in some circumstances, which argues that the inference is indeed a presupposition:

- (47) None of these ten boys ran fast
Inference: all of these ten boys ran
- (48) None of these ten boys solved the exercise twice.
Inference: all of these ten boys solved the exercise

However, not all adverbs seem to behave in the same way: the adverb *carefully*, e.g. seems to project rather weakly, if at all:

- (49) None of these ten boys searched the bags carefully
???→everyone searched the bags

The curious fact that we can observe now is that the projection facts above seem to correlate with the island inducing behavior of the adverbs above. In particular, observe that quantificational adverbs such as *twice* and adverbs such as *fast*, which seemed to stand with a factive presupposition above, are also robust interveners in split constructions [cf. de Swart (1992)].

(50) *Combien as-tu beaucoup/souvent/peu/rarement consulté de livres? [French]

how many have you a lot/often/a little/ rarely consulted of books

(51) *Combien Marie a-t-elle vite mangé de gateaux?

How many Marie has-she fast ate of cakes

However, the adverb *carefully* e.g., which seemed to show a weak presuppositional behavior, has been reported not to induce a weak island effect:

(52) ?Combien le douanier a-t-il soigneusement fouillé de valises?

How-many the customs-officer has-he carefully searched the suitcases

[cf. Obenauer (1984)]

Non-split constructions also seem to be sensitive to adverbial interveners, however the effect is said to be somewhat weaker from the one we can observe in split constructions (cf also den Dikken and Szabolcsi (2002)):

(53) ???How much milk did John spill on his shirt often?

(54) ???How much milk did John spill on his shirt quickly?

(55) ?How much milk did John spill on his shirt carefully?

What we can observe then is that quantificational adverbs and some other adverbs like *late*, *fast*, etc are more prone to triggering a “quasi-presupposition” than other adverbs: e.g. *carefully* does not seem to trigger a presupposition in the same fashion. Consequently, the former but not the latter seem to provoke intervention. The difference that we can observe between the various adverbs is probably triggered not so much by the

particular adverbs themselves, but rather by the interaction of the context and the content of the whole sentence. And while such “quasi-presuppositions” are not yet well understood, given their (quasi-)factive inference, the explanation why *wh*-constructions that contain adverbs are sensitive to weak islands will be very similar to what we have seen above in the case of factive and extraposition islands. Further, as adverbs do not seem to be uniform in the strength of the quasi-presupposition they invoke, this analysis has the capacity to predict a certain amount of variation with respect to individual adverbs. This might be a welcome result, because even quantificational adverbs do not seem to be particularly robust interveners in general (except in split-constructions).

4.2.2. Islands created by part-time triggers?

Some verbs can invoke a factive-like inference in some contexts, but not others (eg. *tell*, *learn*, cf. Schlenker (2006b)). In this section I would like to tentatively suggest that some of these verbs, when they stand in a context in which they trigger the inference in question, might also induce weak islands. The examples below illustrate the case of *learn*:

- (56) How did you learn in school that France behaved during the Vichy regime?
(57) *How did you learn yesterday that Mary’s leg hurts? (with intended interpretation: I learned yesterday that Mary’s leg hurts badly, e.g.)

However, one might object that *learn* in the above examples actually translates to several different lexical items in many languages (e.g. German, Hungarian), therefore it might be the case that we are simply dealing with a factive version of *learn* in the above case. Interestingly enough, in the case of *tell*, Hungarian might provide us with examples that might show that the island-inducing property of part-time triggers comes and goes with the unstable factive inference. It seems to me that in Hungarian whether or not *tell* stands with a factive inference correlates with the focus structure (or the nature of the alternatives) of the sentence. If the verb itself is focussed as in (58)b, or it stands with a

perfective prefix (58)a, it tends to trigger a factive inference. If however, something else in the sentence than the verb is focussed, the inference disappears (59)⁴⁴:

(58) *factive implication:*

- a. Péter EL.mondta Jánosnak hogy Mari megevett öt almát. (Did he tell him?)
Peter PRF.told János that Mari ate five apples
- b. Péter MONDTA Jánosnak hogy Mari megevett öt almát (Did he tell him?)
Peter TOLD János that Mari ate five apples

(59) *no factive implication:*

- a. Péter AZT modta Jánosnak hogy Mari megevett öt almát (What did he tell him?)
Peter THAT told János that Mari ate five apples
- b. PÉTER mondta Jánosnak hogy Mari megevett öt almát (Who told him that?)
PETER told János that Mari ate five apples
- c. Péter JÁNOSNAK mondta hogy Mari megevett öt almát (Who did he tell it to?)
Peter TO-JANOS told that Mari ate five apples

In the case of questions the focus structure is typically hijacked by wh-movement, as the wh-word moves into the focus position, but the presence of the perfective prefix still invokes a factive inference. Interestingly, if the particle is present, wh-movement of the degree phrase is not possible, however, it seems to be (nearly) acceptable if the particle is not present:

- (60) a. ?Hány almát mondott Mari Péternek hogy Gábor megevett?
- b. *Hány almát mondott el Mari Péternek hogy Gábor megevett?
How many apples told (prt) Mari to Peter that Gabor ate?

That the above is probably not simply an example of lexical ambiguity of *tell* correlating with the prefix might be shown by questions in which the verb is still focussed (which is possible in emphatic contexts):

⁴⁴ In the case of the perfective version of *tell* however (elmond), the inference remains regardless of the focus structure.

- (61) a. ?(Ertem, de,) Kit MONDOTT János Gábornak hogy Mari meghivott?
 (I understand but) who TOLD Janos to-Gabor that Mari invited?
 (ok, but I want to know:) Who did John TELL Gabor that Mari invited?
- b. *(Ertem, de,)Hány almát MONDOTT János Gábornak hogy Mari megevett?
 (I understand but) How many apples TOLD Janos to-Gabor that Mari ate?
 (ok, but I want to know:) How many apples did John TELL Gabor that Mari ate?

Although the above discussion is extremely preliminary at this stage, but if it is on the right track, it might provide an interesting step towards showing that indeed the island-creating behavior of the interveners in question depends on nothing other than their factive inference.

4.3 A problem? Response stance predicates and modals

Cattell (1978) Hegarty (1992), Szabolcsi and Zwarts (1993), Honcoop (1998), have argued that the class of verbs that create weak islands also includes *response stance verbs* (in Cattell's terminology). Though not factive, these verbs are normally uttered in response to something that is assumed to be part of the common ground or to something that someone proposed to update the common ground with:

- (62) response stance verbs: deny, verify, admit, confirm, accept, acknowledge

These verbs are presuppositional in the sense that they “presuppose that their complements express assumptions or claims held by someone possibly other than the speaker which are part of the common ground” (Honcoop (1998) p.167).

- (63) *x denied that p*
 presupposes: it is assumed by someone that p

As the example below shows, response stance predicates induce weak islands as well:

(64) *How did Bill deny/admit/verify that John fixed the car?

Can the reasoning above as for why factive verbs create weak islands be extended to response stance verbs? It could, if their presupposition was anaphoric, relative to a contextually salient individual whose assumptions are being presupposed. Is this indeed the case? Cf. the following example:

(65) *Context: Peter, Fred and Mark and their wives. Each of Peter, Fred and Mark believe that John slept with their wives (and only their wives).*

Which of these 3 women did Bill deny/admit that John slept with?

Is this sentence felicitous? If yes, the assumption that the existential quantifier in the presupposition is anaphoric to a single salient individual is too strong. Unfortunately, it seems to me that the sentence can be uttered in the above context. However, if this is indeed the case, a contradiction is not predicted by the present account. What we can observe here is that an existential quantifier in the presupposed material fails to obviate the island effect, contrary to our expectations. We can also observe this in examples that contain a true factive verb, but also an existential modal in the scope of the factive verb, which similarly, the present account predicts to be acceptable, it seems contrary to fact (though the facts are not very clear).

(66) ??How did Mary regret that Bill might have behaved?

The reason why the example above should be acceptable is that now the presuppositions of the various alternatives could be all true in different possible worlds, and therefore a contradiction would not arise. At the moment I do not understand why the existential in the presupposition of response-stance predicates, or the existential modal in the scope of the factive verb fails to obviate the weak-island effect. I suspect that the problem has to do with the notoriously complex and often problematic interaction of presupposition

projection with existential quantification. Yet, a detailed analysis of this issue will have to wait for another occasion.

5 Islands created by *only*

Questions that contain an *only* NP also create weak island contexts. In this section I will argue that this is also due to such questions standing with contradictory presuppositions. Before we can get to the argument however, it is necessary to briefly review some key assumptions about the semantics and pragmatics of *only*. It is well known that that a sentence of form *only* ϕ conveys that ϕ is true. E.g. the sentence in (67)a conveys that Muriel voted for Hubert ((67)b):

- (67) a. Only Muriel voted for Hubert
b. Muriel voted for Hubert

It is equally well known that deciding what is the correct characterization of the relationship between (67)a and (67)b above has proven to be rather difficult. There are at least three different types of approaches to this question: Atlas (1993, 1996) has proposed that the relationship is that of entailment; McCawley (1993) and van Rooij and Schulz (2005) have argued that the relationship is that of implicature; while a number of different proposals have been put forth arguing that this relationship is that of a presupposition (e.g. Horn (1969), Horn (1996), Rooth (1985), Geurts and van der Sandt (2004), Beaver (2004), Roberts (2006), Ippolito (2006) among others.) The presuppositional analyses come at least in three variants: the strong presuppositional analysis (e.g. Horn (1969), Rooth (1985)), the weak presuppositional analysis (Horn (1996), Geurts and van der Sandt (2004), Beaver (2004)) and the conditional presupposition analysis Ippolito (2006). In the remainder of this section I will restrict my attention to the presuppositional approaches to *only*, which seems to be the most promising approach. (cf. Ippolito (2006) for a detailed review of all types of approaches). In the following sections I will discuss what the predictions of the three versions of the presuppositional analyses are for the questions that we are interested in. I will show that

in fact under the all the three approaches to *only*, manner and degree questions are predicted to be unacceptable.

5.1 The strong presuppositional analysis of *only*

According to the strong presuppositional approach to *only*, (cf. Horn (1969), Rooth (1985)) *only* ϕ presupposes the truth of ϕ (a.k.a the prejacent). Given such a strong presupposition, the reasoning based on contradictory presuppositions can be easily extended to the intervention created by *only*: manner and degree questions that contain *only* are predicted to presuppose a contradiction. This is because if, as was argued earlier in this chapter, presupposition projection from the alternative answers is universal, then any manner or degree question would be predicted to stand with a set of contradictory presuppositions. Take e.g. a question such as (68). In this case, as I have argued in chapter 2, the manner alternatives might be restricted, yet any set will at least contain 3 contraries, for example if our context is restricted to the dimension of politeness, our set of propositions in the Hamblin set might look as in (69):

(68) *How did only John behave?

(69) [[*How did only John behave?]]

={that only John behaved politely,
that only John behaved impolitely,
that only John behaved neither politely nor impolitely},

If all of these alternatives presupposed the prejacent that only combines with (in our case *that John behaved politely, that John behaved impolitely, that John behaved neither politely nor impolitely*), then by universal projection we would derive that such a question should trigger contradictory presuppositions. As it is easy to see, a similar reasoning could also be extended to questions about degrees, as in this case the alternative would be based on the various intervals that do not necessarily have to overlap.

5.2 The weak presuppositional analysis for *only*

One potential objection for the above outlined explanation as to why *only* creates intervention might come from the arguments that seem to show that the above proposed presupposition for *only* might be too strong. The first problem, observed by Horn (1996), Geurts and van der Sandt (2004) is that the putative presupposition does not project in modalized sentences:

- (70) It is possible that only the Red Sox can beat the Yankees, and maybe not even they can.

The second problem, also observed by Horn (1996) is manifested by the fact that question-answer exchanges such as the one below are felicitous. This is a problem because if the truth of the prejacent was indeed that presupposition in the context of the conversation, the question should have been infelicitous in the first place. However, it is perfectly acceptable.

- (71) A: Who can beat the Yankees?
B: Only the Red Sox.

The above authors therefore have suggested a weak presuppositional analysis. The sentence such as *only Muriel voted for Hubert* triggers the inference that *Muriel voted for Hubert* is true. However, according to the above authors this inference comes about as a combination of the truth conditional meaning of *only* and an existential presupposition. Thus:

- (72) Only [Muriel]_F voted for Hubert
presupposes: Someone voted for Hubert
Asserts: No one other than Muriel voted for Hubert
→inference: Muriel voted for Hubert

Exactly what the source of the existential presupposition is, i.e. whether it is triggered by focus Geurts and van der Sandt (2004), or (also) by *only* itself Beaver (2004), or by the

existential import of a universal quantification Horn (1996) is a matter of ongoing debate. Yet whatever the source of this presupposition might be, the problem we have now that this weaker presupposition is not strong enough to derive a contradiction. Take a look at (69) again: if each alternative in the Hamblin set only presupposes that *someone* behaved in α , then in the case of (69) by universal presupposition we derive that a complete answer should stand with the set of presuppositions: {*that someone behaved politely, that someone behaved impolitely, that someone behaved neither politely nor impolitely*}. In other words the offending contraries in this case would be distributed over various individuals, and therefore the contradiction would be avoided.

However, as it is well known, the previous counterargument is not without counterarguments either. E.g. Ippolito (2006) argues convincingly that the weak-presuppositional analysis is also not without its problems: e.g. it does not predict the correct inference for a sentence such as the one below:

(73) *Only John and Mary ate cookies.*

The problem is that in a context where it is known that only John ate cookies, the above sentence is predicted to be true by the weak-presuppositional analysis, contrary to fact.

Secondly, as it was pointed out by many, in negative sentences like (74) the presupposition seems to be stronger, as if *only AB* indeed presupposed the truth of *AB*, as was originally proposed in Horn (1969).

(74) Not only Muriel voted for Hubert *presupposes*: Muriel voted for Hubert

The reason why this inference is not a conversational implicature is that it seems to project, as shown by (75):

(75) It is possible that not only Muriel voted for Hubert

Beaver (2004) shows that this stronger presupposition in the case of negative sentences can be derived if we assume that under negation the whole phrase *only Muriel* is

focussed, and the focus alternatives of an *only NP* are itself and the NP without *only*. If focus stands with the presupposition that one of the focus-alternatives is true, (74) is correctly predicted to presuppose that *Muriel voted for Hubert*.⁴⁵

5.3 Conditional presupposition for *only*

To remedy the problems that plague the previous two types of analyses for *only*, Ippolito (2006) has proposed recently that *only* in fact stands with a conditional presupposition of the form below:

(76) Presupposition of *only* ϕ : If some proposition among the focus alternatives of *only* is true, then ϕ is true.

⁴⁵ It seems to me that even if the weak-presuppositional analysis were to turn out to hold water for *only*, we could still adopt a similar analysis to *only NP*'s to that of Beaver (2004) in questions to rescue our analysis of questions containing *only*. But is the prediction that in questions we again see the stronger presupposition of *only* correct? Let's look at a question about individuals containing an *only NP* phrase:

(5) Which exercise did *only John* solve?

The presupposition in Horn (1996) predicts that a complete answer to the above question of the form *Only John solved Ex1* should be understood as (6)a, while the stronger presupposition according to Horn (1969) predicts the meaning of a complete answer together with its presuppositions as in (6)b:

(6)

- (a) John and no one else solved Ex.1 and for all the other exercises in the given domain, some (other) people solved them.
- (b) John and no one else solved Ex.1 and for all the other exercises in the given domain, John and other people solved them.

It seems to me that the reading that complete answer to the above question such as *Only John solved Ex1* gets is certainly much stronger than that in (6)a, in particular a complete answer stands with the inference that in fact John has solved many other exercises than Ex1. For this reason, I we might assume that indeed in questions *Only NP* phrases tend to get focussed, similarly to what Beaver (2004) has suggested for negative sentences. Thus (7) is in fact understood as below, and a complete answer is exemplified in (8):

(7) Which exercise did [only John]_F solve?

(8) $\|Exh\|^w (\| (5) \|) (\lambda w'. \text{only John solved exercise 1 in } w')$

= Only John solved exercise 1 in w &

$\forall q \in \{\lambda w'. [\text{only John}]_F \text{ solved exercise } x \text{ in } w' \mid x \in \{D_e - \{Ex\ 1^*\}\}, q(w)=0$

presupposition: $\forall x \in D_e. \text{John solved } x \text{ in } w$

assertion: no one other than John solved Ex 1 & $\forall x \in \{D_e - \{Ex\ 1^*\}. \text{someone other than John solved exercise } x \text{ in } w$

With this background a manner and degree questions are again predicted to give rise to contradictory presuppositions, just as I have outlined it a few paragraphs above. E.g. a manner question such as the one above will be now understood as having focus on the constituent [only John] à la Beaver (2004). This way, we derive that in a situation such as above a complete answer will presuppose that *{that John behaved politely, that John behaved impolitely, that John behaved neither politely nor impolitely}*. This is however a contradictory set of propositions, and as such, it cannot be satisfied in any context.

contradiction. It is easy to see that the above argument generalizes to situations where the context contains more individuals and manners, given the assumption defended in the previous chapter that for any manner its contraries will always be among the question alternatives. Since in any domain of degrees, there will be non-overlapping intervals that jointly cover the domain, the above reasoning can be straightforwardly extended to degree questions as well.

5.4 Exactly one

Contrast now the behavior of *only* with that of *exactly one*:

(78) How did exactly one girl think that you behaved?

Because *exactly one* is not presuppositional, for an answer such as *Exactly one girl thought you behaved politely* to be assertable as a complete answer, nothing else need to be taken into account than its assertive component. In this case this will be that exactly one girl thinks that you behaved politely, and for every manner in the domain other than politely, it is not true that exactly one girl thinks that you behaved that way. But this requirement is easily satisfied, even in a context where no one thinks anything except for the one girl who thought you behaved politely. Hence, quantifiers such as *exactly one* are not predicted to cause any intervention effects. As the acceptability of (78) shows, this is in fact a welcome prediction.

6 Summary

In this chapter I have argued that the presuppositions of propositional alternatives in the H/K denotation project in a universal manner. This has derived the basic facts of manner and degree weak islands created by factive verbs. The main idea was that in these cases a universal presupposition pattern gives rise to a contradictory set of presuppositions. I have also argued that question that has a variable in the scope of a factive verb might in fact stand with a singleton presupposition if it is understood as an identity question. I have shown that precisely in these cases (which coincide with the cases of so called D-linking) the island effect in manner and how many questions disappears, which is in

accordance with the prediction made in this chapter. I have also extended the analysis to islands created by extraposition islands and certain less stable triggers such as adverbs and verbs that sometimes can appear as if there were factive such as *tell*. Finally I have argued that intervention caused by *only* belongs to the group of presuppositional interveners as well and have examined different ways of how such a prediction might arise.

Chapter 5

Wh-Islands

1. Introduction

In the previous chapters I have been concerned with the property of the domain of manners and degrees that it contains exclusive elements. A complete answer was not possible in the case of negative and presuppositional islands, because certain alternatives that were exclusive had to be true at the same time. In this chapter I turn to *wh*-islands, and argue that an account essentially in the same spirit can be extended to them as well. The basic pattern that I aim to explain in this chapter is that in (1) and (2) below:

- (1) a. ?Which problem do you wonder how to solve?
b. *How do you know which problem to solve?
c. *How high do you wonder who to lift?

- (2) a. ?Which problem do you know whether to solve?
b. *How do you wonder whether to solve the problem?
c. *How tall do you know whether to be?

What these examples show is that an interrogative complement clause seems to create a weak island of which *wh*-words ranging over individuals can move out, but not degree or manner constituents. The core idea that I will develop in this chapter is that the ungrammatical questions above are unacceptable because a complete (exhaustive) answer to them is either a contradiction (as I will argue is the case with the questions about

degrees) or a violation the principle of maximize presupposition (originally proposed in Heim (1991)), as I will argue is the case with questions about manners.

Recall briefly the logic behind the analysis for negative islands that was presented in Chapter 3. Following Dayal (1996) I have proposed that that a question presupposes that it has a most informative true answer.

(3) *Maximal Informativity Hypothesis* (Dayal 1996)

A question presupposes that it has a maximally informative true answer

Since in the case of negative islands there could never be a maximal answer, the statement for any answer that it is the complete (exhaustive) answer, i.e. the maximal true answer conjoined with the negation of the false answers, amounted to a contradiction.

In this chapter I aim to show that essentially the same idea can be extended to wh-islands as well. The point of departure will be again the Maximal Informativity Hypothesis of Dayal (1996). Given this condition, and certain natural assumptions about manners and degrees, the analysis that I present in this chapter predicts that examples of wh- islands should be unacceptable: In the case of degree questions I will argue that they cannot have a most informative true answer, and therefore complete answers to them express a contradiction

- (4) A. *How high do you wonder who to lift?
b. *How tall do you know whether to be?

In the case of manner questions such as (5) below, the situation will be slightly different: Although these will have a most informative true answer (e.g. (5)b), however, this answer will always be contextually equivalent to its counterpart with an embedded declarative (in this case (5)c). Since the answer with the embedded interrogative comes with a vacuous presupposition, while the answer with the embedded declarative has a contentful presupposition, any answer to the question in (5) will be argued to be a violation of the principle of Maximize presupposition (Heim (1991), Sauerland (2003), Percus (2006), Schlenker (2008)).

- (6) Who left?
- (7) $\lambda p. \exists x [\text{person}(x)(w) \wedge p = \lambda w'. x \text{ leaves in } w']$ = $Q_H(w)$
- (8) $\lambda p. \exists x [p(w) = 1 \wedge \text{person}(x)(w) \wedge p = \lambda w'. x \text{ leaves in } w']$ = $Q_K(w)$
- (9) $\lambda w' [\lambda x. \text{left}(x)(w) = \lambda x. \text{left}(x)(w')]$ =G&S

How are such question meanings arrived at compositionally? In this section I address this question, focusing my attention on the Hamblin/Karttunen denotation.

Originally Karttunen (1977) has proposed that *wh*-words such as *who* denote existential quantifiers. In our terms, his proposal could be expressed as shown below:

$$(10) \quad \llbracket \text{Who} \rrbracket^w = \lambda P_{\langle e, t \rangle}. \exists x [\text{person}(x)(w) \wedge P(x)(w) = 1]$$

Such quantifiers cannot directly combine with their sister constituent via function application, instead they are ‘quantified in’ into the question via a special *wh*-quantificational rule⁴⁷.

In this thesis I use a variant of this approach, worked out in lecture notes by Irene Heim (Heim (2001)) where the *wh*-word, instead of denoting a simple existential quantifier over individuals, is a higher type ‘question quantifier’, as shown below: (Notice also that the way the lexical entries are formulated below derives in fact the Hamblin-denotation of the question)

$$(11) \quad \llbracket \text{Who} \rrbracket^w = \lambda Q_{\langle e, \langle st, t \rangle \rangle}. \lambda p. \exists x [\text{person}(x)(w) \wedge Q(x)(p)]$$

Given regular assumptions about quantifier movement and lambda abstraction (c.f. Heim and Kratzer (1998)), this quantifier can now directly combine with its sister constituent,

(1) ???Which men did John ask whether Bill invited?

⁴⁷ Wh-quantification rule of Karttunen (1977), in our notation (cf also discussion in Guerzoni (2003)):

(2) If α has daughters β and γ , where
 $\llbracket \beta \rrbracket^{w, g}$ is type $\langle \langle \sigma, t \rangle, t \rangle$ and $\llbracket \gamma \rrbracket^{w, g}$ is type $\langle \sigma \langle st, t \rangle \rangle$, then for every word w and assignment g :
 $\llbracket \alpha \rrbracket^{w, g} = \lambda p. \llbracket \beta \rrbracket^{w, g} (\lambda x_{\sigma}. p \in \llbracket \gamma \rrbracket^{w, g}(x)) = 1$

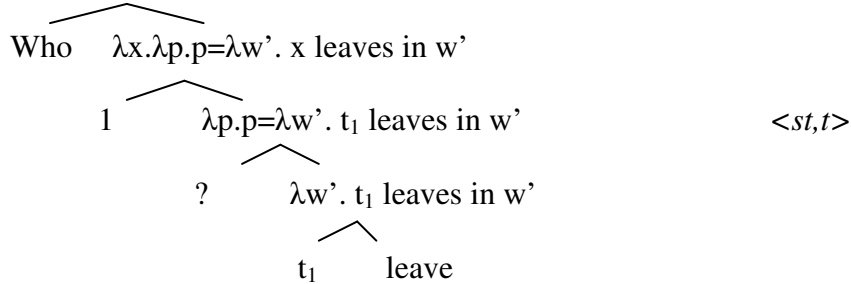
without resorting to a special combinatory rule like that of *wh*-quantification⁴⁸. Here is how. Following the spirit of Karttunen (1977), we postulate that a question morpheme turns an expression of type $\langle s,t \rangle$ (a proposition) into a set of propositions of type $\langle st,t \rangle$.

$$(12) \quad [?] = \lambda q_{\langle s,t \rangle} . \lambda p_{\langle s,t \rangle} [p=q]$$

This question morpheme might be located in the syntactician's C-head. Wh-movement creates an abstract in the usual fashion, of type $\langle e \langle st,t \rangle \rangle$. The *wh*-word, a question quantifier, as assumed in (11), is of type $\langle \langle e \langle st,t \rangle \rangle, \langle st,t \rangle \rangle$, and can combine with this abstract via simple function application. The derivation of a simple constituent question is then as shown below:

(13) Who left?

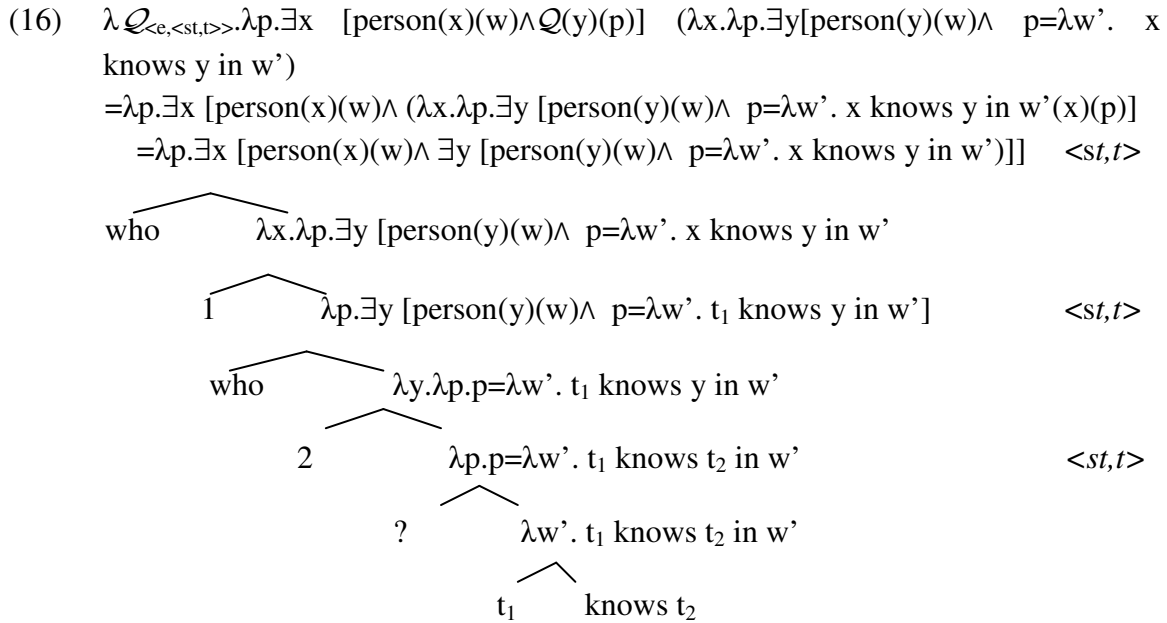
$$(14) \quad \lambda p . \exists x [\text{person}(x)(w) \wedge p = \lambda w' . x \text{ leaves in } w'] \quad \langle st,t \rangle$$



Notice that the C-bar expression (the proto-question, in Karttunen (1977)'s terms) has an extension of type $\langle st,t \rangle$, which is of the same type as that of the extension of the question itself. This has the consequence that it is possible to iterate *wh*-words in the system: the second *wh*-word creates a new abstract, which can again combine with the *wh*-word by function application. An example derivation is shown below:

(15) Who knows who?

⁴⁸ As noted in Heim (2001), this difference in itself is largely technical: given current assumptions the



One thing we might notice is that the order of the movement of the *wh*-words is not constrained in this system, just as other instances of quantifier movement are not restricted by the combinatory semantic system itself.⁴⁹

2.2 Embedded questions and predicates that embed them

Generally, it is assumed that embedded questions such as (17) e.g. should have the same denotation as matrix questions.

(17) John knows who left

(18) Know (*w*) (*x*, *Q(w)*)

In the Hamblin/Karttunen approach to questions, this would mean that they both denote a set of propositions. In the theory of Groenendijk and Stokhof (1982,1984), both matrix and embedded questions denote propositions. Compositionally, the meaning of the whole sentence is arrived at by assuming that question embedding verbs (QEVs) such as *know* or *wonder* express a relation between a subject and the embedded question. However, it

⁴⁹ 'cost' of movement is less than the 'cost' of positing an extra combinatory rule.

⁴⁹ Such freedom is in fact needed for languages that do not observe the subject-object asymmetries known as superiority effects (e.g. Hungarian), but of course it raises a series of well-known questions as to why **What bought who* should be unacceptable in English. Cf. e.g. Richards (2001) for discussion.

has been argued that this general picture needs to be nuanced somewhat, and correspondingly, that QEVs can be classified in number of different ways.

The first way of classification of question embedding verbs might be according to the semantic type of the complement they take. In this respect, Groenendijk and Stokhof (1982, 1984) has proposed that question embedding verbs can be either extensional or intensional. Extensional verbs take the extension of the embedded interrogative as their complement, while intensional verbs take the intension of the embedded interrogative as an argument. Typically, extensional verbs can take *that*-complements, while intensional verbs cannot. According to their classification, *know* is an example of an extensional verb, and a predicate like *wonder* is the prototypical intensional verb.⁵⁰ As such it should establish a relation between the subject and the intension of the embedded question.

Lahiri (2002) argues for a somewhat different classification from that of Groenendijk and Stokhof (1982, 1984). He classifies interrogative-embedding predicates into responsive (the *know*-type) and rogative (the *wonder*-type). Rogative predicates are fundamentally proposition taking, i.e. they are of type $\langle\langle s, t \rangle b \rangle$. This is in accordance with Groenendijk and Stokhof (1982, 1984) and our earlier discussion in Chapter 1 of theories rooted in Heim (1994). The *wonder*-type predicates however are of the type $\langle\langle\langle s, t \rangle t \rangle, b \rangle$, that is they take genuine question-complements⁵¹.

In a system such as Lahiri's (2002) thus responsive predicates take propositions as complements. I will assume that this proposition can be created from a H/K denotation via an answer operator, as discussed in Chapter 1. (cf Heim (1994), Jacobson (1995), Beck and Rullmann (1999)). In this case the question-embedding verb *know* establishes a

⁵⁰ A verb like *agree* would be presumably an intensional verb under this classification, although it can take *that*-complements. However, Beck and Rullmann (1999) argue that *agree* cannot be classified as either intensional or extensional in the sense of Groenendijk and Stokhof (1982, 1984), because the lexical semantics of *agree* makes use of answers to the embedded question, identifiable propositions.

⁵¹ An account that is technically different, but similar in spirit is proposed in Krifka (2001), who also argues that the *wonder*-type verbs take complements of a different type than the *know*-class. In his system, the former, but not the latter class embeds speech acts (more precisely root questions, in his terminology). He also cites a syntactic argument from McCloskey (1999):

- (1) a. Which dish did Al make, Doris wondered / asked / wanted to find out.
b. *Which dish did Al make, Doris found out / knew / told Elizabeth.

He argues further that these examples should not be regarded as direct speech as one can have, for example, *Which dish did she_i make, Doris_j wondered.*

relation between its subject and a proposition created by Heim (1994)'s Ans2 operator, which outputs the complete true answer to the embedded question⁵².

- (19) a. Bill knows who left
b. know (Bill, (Ans2(Q_H)(w)))

Rogative question embedding verbs such as *wonder* however are of the type $\langle\langle\langle s,t \rangle t \rangle, b \rangle$, and therefore they take genuine question-complements.

- (20) A. John wonders who left.
b. Wonder(w) (John, Q_H(w))

The second way of classifying question embedding verbs is whether they require their complements to be understood as strongly exhaustive. While Groenendijk and Stokhof (1982, 1984) have famously argued that embedded questions in general should be understood as strongly exhaustive, Heim (1994) and following her Beck and Rullmann (1999), Guerzoni and Sharvit (2004) have argued for a theory that has more flexibility, namely allows for at least some embedded questions to be understood as weakly exhaustive. In this respect, a three-way classification is often assumed (cf. e.g. Guerzoni and Sharvit (2004), Sharvit (1997)) according to which predicates such as *wonder* always strongly exhaustive⁵³, predicates belonging to the *know*-class can be understood as both strongly and weakly exhaustive, while predicates such as *be surprised* only allow weakly exhaustive readings:

⁵² Beck and Rullmann (1999) has argued that certain responsive question embedding predicates, e.g. *agree* might require that the subject be in a certain relation not with the unique true proposition that is answer to the embedded question, but with the propositions that could be answers to the question, i.e. the propositions in the Hamblin-denotation of the question. However, as Danny Fox (pc) has suggested to me, it could also be that *agree* takes a proposition as complement, which is evaluated in the belief worlds of the subjects, instead of the actual world.

⁵³ But note that this claim is not uncontroversial, cf. discussion e.g.in Sharvit (1997).

(21) *Wonder, ask, want to know, inquire...*

- a. John wonders who left
- b. Strongly exhaustive reading:
for every x, if x left, John wants to know that x left,
and if x did not leave, he wants to know that x did not leave

(22) *Know, find out, remember, be certain,...*

- a. John knows who left
- b. (weakly exhaustive reading: for every x, if x left, John knows that x left)
- c. strongly exhaustive reading:
for every x, if x left, John knows that x left
and if x did not leave, John knows that x did not leave

(23) *Surprise, predict, ?realize*

- a. It surprised John who left
- b. Weak (exhaustive) reading:
for every/some x, if x left, it surprised John that x left

In the second part of this chapter I will argue that it is the strong exhaustive property of embedded questions combined with the special properties of the domain of manners and degrees that leads to the impossibility of moving manner and degree *wh*-constituents out of embedded questions⁵⁴.

2.3 Embedded *whether*-questions

Let's turn now to embedded *whether*-questions. Such constituents are usually thought of as embedded yes-no questions. According to a Karttunen (1977)-style analysis, *whether* is an existential quantifier similar to *who*, except instead of individuals it quantifies over functions of type $\langle t, t \rangle$ ⁵⁵. Here again I will assume, following the line developed in Heim

⁵⁴ In Hungarian, the surprise/realize class of question embedding predicates creates strong islands, i.e. it is barrier for *wh*-items ranging over individuals as well as for manner and degree *wh*.

⁵⁵ Karttunen meanings: *whether* as a quantifier over functions of type $\langle t, t \rangle$.

(2) $[[\text{Whether}]] = \lambda f_{\langle t, t \rangle} \exists h_{\langle t, t \rangle} [(h = \lambda t. t \vee h = \lambda t. t = 0) \wedge f(h) = 1]$

(2001), (cf. also Guerzoni (2003)) that *whether* itself is analyzed as a quantifier over a higher type, namely over functions of type $\langle\langle t,t\rangle,\langle st,t\rangle\rangle$:

$$(24) \quad \llbracket \text{Whether} \rrbracket = \lambda Q_{\langle\langle t,t\rangle,\langle st,t\rangle\rangle} . \lambda p . \exists h_{\langle t,t\rangle} [(h = \lambda t . t \vee h = \lambda t . t = 0) \wedge Q(h)(p)]$$

Similarly to quantifiers over individuals, when *whether* moves, it leaves a trace of a lower type, here $\langle t,t\rangle$. As matrix yes/no questions are analyzed as containing a silent *whether*, a derivation of a yes/no and an embedded *whether* question will be the same. It is shown below.

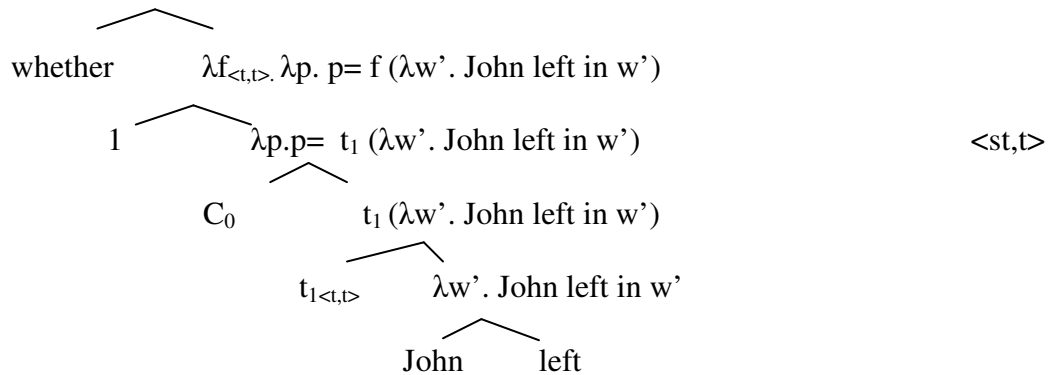
(25) *whether* John left /Did John leave?

$$(26) \quad \lambda p . \exists h_{\langle t,t\rangle} [(h = \lambda t . t \vee h = \lambda t . t = 0) \wedge (\lambda f_{\langle t,t\rangle} . \lambda p . p = f(\lambda w' . \text{John left in } w')(h)(p))] =$$

$$\lambda p . \exists h_{\langle t,t\rangle} [(h = \lambda t . t \vee h = \lambda t . t = 0) \wedge p = h(\lambda w' . \text{John left in } w')]$$

since there are only two possible values for h, this is equivalent to

$$\lambda p . [p = \lambda w' . \text{John left in } w' \vee p = \lambda w' . \text{John } \neg \text{left in } w'] \quad \langle st,t\rangle$$



Given this (admittedly rather complicated) derivation of the Hamblin denotation of the embedded *whether* clause⁵⁶, we can look at the interpretation of a *whether* clause under a question embedding verb such a *know*. As argued above, this verb establishes a relation between the subject and the unique true answer to the question: What (27)b says is that a

⁵⁶ A disadvantage of this way of deriving the denotation of the *whether*-constituent is that—unlike Karttunen (1977)’s original proposal—it does allow a *wh*-constituent to be moved under *whether*, which does not seem to be desirable **John knows whether who came*.

certain relation holds between Bill and either the proposition that John walks, or the proposition that John does not walk, whichever is true in w ⁵⁷.

- (27) a. Bill knows whether John left
b. $\text{know}(\text{Bill}, (\text{Ans2}(\text{Q}_H)(w)))$

In other words, *know* establishes a relation between the subject and the complete true answer to the question. Given our earlier assumption about the semantics of *wonder*, it expresses a relation between a subject and the question itself:

- (28) a. Bill wonders whether John left
b. $\text{wonder}(w)(\text{Bill}, (\text{Q}_H)(w))$
b'. $\text{wonder}(w)(\text{Bill}, \lambda p [\text{p}=\lambda w'. \text{left}(j)(w') \vee \text{p}=\lambda w'. \neg \text{left}(j)(w')])$

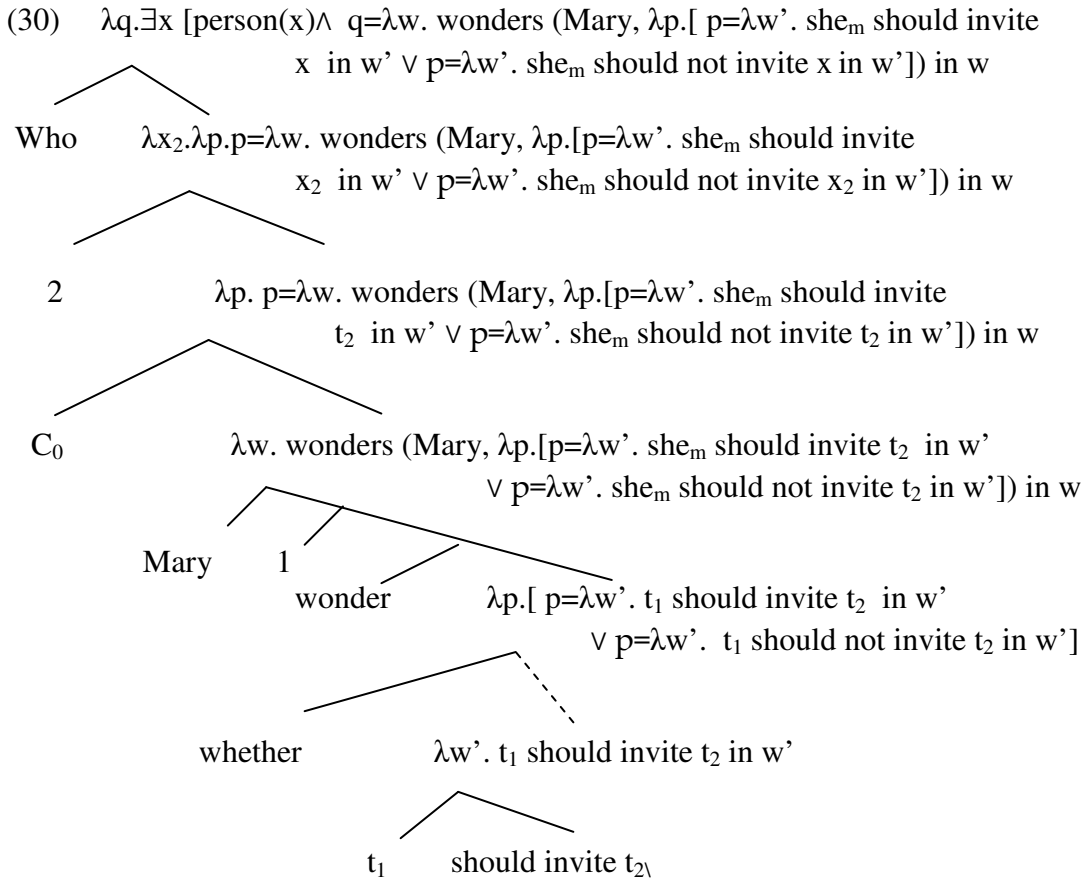
2.4 Movement from the embedded interrogative

In this section I spell out what happens when a constituent moves out of an embedded interrogative complement. Cf:

- (29) Who does Mary wonder whether she should invite?

The derivation of this example is shown below:

⁵⁷ In this case the strongly exhaustive aspect of *Ans2* is trivially satisfied.



Observe that as far as the semantic compositional system is concerned, this movement is rather unconstrained, e.g. nothing would prevent the subject moving out either, and thus a strong island violation. (cf. also Karttunen (1977)) In fact, nothing would even prevent constituent movement below *whether*: **Mary wonders whether who to invite*⁵⁸. More interestingly for the purposes of the present chapter, observe that nothing would prevent the movement of the *how/how many* phrase from the embedded complement either:

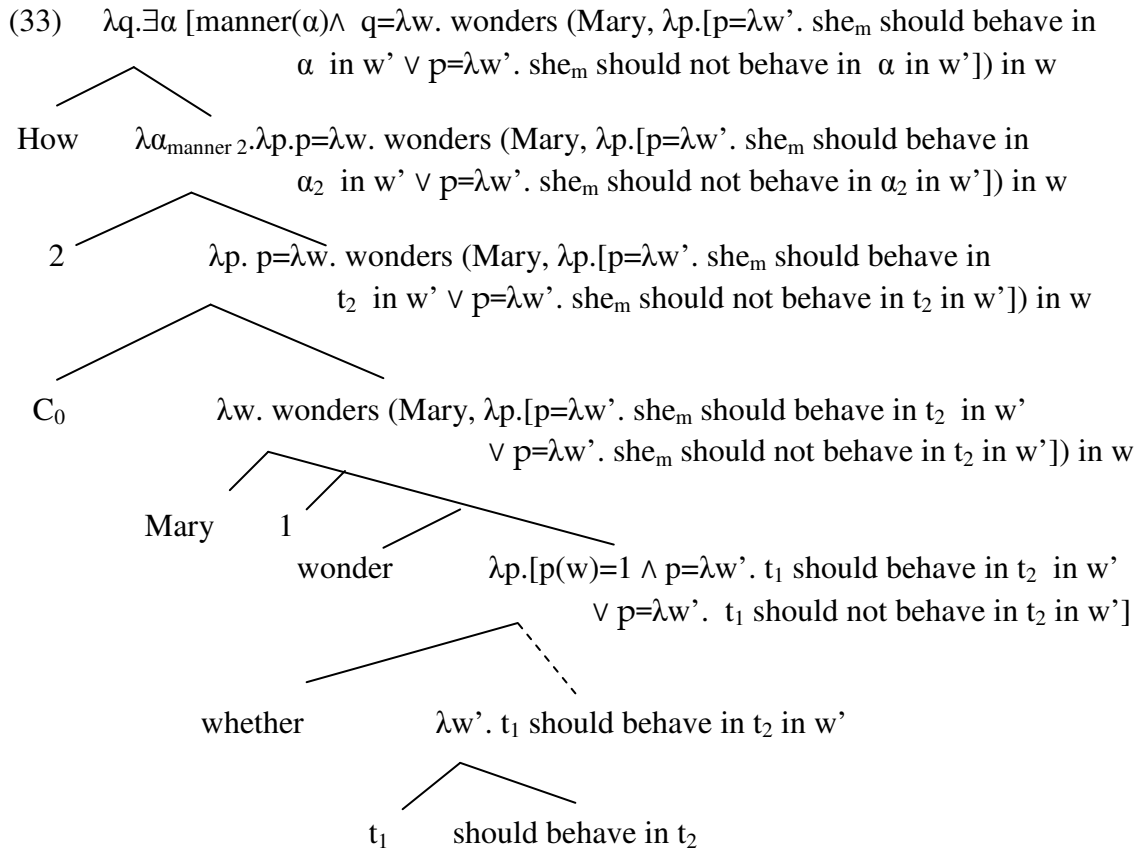
(31) *How does Mary wonder whether she should behave?

Let's assume that the *how* phrase receives the following interpretation, in accordance with our earlier assumptions:

(32) $[[\text{How}]] = \lambda Q_{\langle e, t \langle st, t \rangle \rangle}. \lambda p. \exists \alpha [\text{manner}(\alpha) \wedge Q(\alpha)(p)]$

⁵⁸ This is a difference with Karttunen (1977)'s original proposal, which does not permit this.

Then the compositional derivation of (31) will proceed as follows:



Thus we see that the compositional system introduced above is very powerful, it allows a number of possibilities that are in fact unattested. Famous examples include superiority violations (34), strong island violations (35), and sentences like (36), of which I will have nothing to say: They might be due either to genuinely syntactic constraints, or constraints imposed by the semantic system⁵⁹ or something else still—this thesis is agnostic about this issue⁶⁰.

(34) *What did who buy?

(35) *Who does Mary wonder whether she should invite?

(36) *Mary wonders whether who she should invite?

⁵⁹ Though note that in Karttunen (1977)'s original system of combinatory rules and lexical items e.g., some of these ((35)) are not derivable.

⁶⁰ Starke (2001) proposes a uniform syntactic explanation to both strong and weak islands. Of course such a theory would be desirable in principle, if it could be argued that it is right. However, I believe that it faces a number of empirical and conceptual difficulties.(cf. Ch 2)

Instead, I will concentrate on a particular problem in this forest of possibilities, namely the issue of *wh*-islands, illustrated in (37) and (38):

- (37) a. Which man are you wondering whether to invite?
b. *How are you wondering whether to behave?
c. *How tall are they wondering whether to be?
- (38) a. ?Which problem do you wonder how to solve?
b. *How do you wonder which problem to solve?
c. *How high do you wonder who to lift?

Note that the restriction that the examples above show is crucially different from the other constraints on movement discussed above. This is because in the case of (37) and (38) their counterpart questions about individuals are acceptable. Therefore, it cannot be a general constraint on movement (be it syntactic or semantic) that rules these questions out. Any analysis of the contrast above will have to take into account the differences between questions about individuals on the one hand and questions about degrees and manner on the other hand. In this chapter I argue that given the assumption about contraries and intervals introduced in the previous chapters, we in fact already have everything in place to explain the problem if *wh*-islands. Therefore, I will argue that the difference between the acceptable and the unacceptable questions above in fact can be reduced to a semantic difference.

2.5 *Wh*-islands and question embedding predicates

Recall the classification of question embedding verbs that was presented in section 2.3 of this chapter (cf. also Heim (1994), Beck and Rullmann (1999) Guerzoni and Sharvit (2004), According to this predicates such as *wonder* always require strongly exhaustive readings, while predicates belonging to the *know*-class can be understood as both strongly and weakly exhaustive. At the same time, it is also the case that the claim that predicates belonging to the *know*-class can have a weakly exhaustive reading is not uncontroversial,

(cf. Sharvit (1997) for an overview) and therefore in the following discussion I will only use their strongly exhaustive readings. The third class was the (very small) class of weakly exhaustive predicates such as *be surprised at* and *predict*.

Which types of question embedding predicates create *wh*-islands? It seems that *wh*-islands arise with both the *wonder*- and the *know*-type of question embedding predicates.

(39) *Wonder class predicates (e.g. Wonder, ask, want to know, inquire...)*

- a. ?Who does Mary wonder whether to invite?
- b. *How is Mary wondering whether to behave?
- c. *How tall is the magician wondering whether to be?

- d. ?Which problem do you wonder how to solve?
- e. *How do you wonder which problem to solve?
- f. *How high do you wonder who to lift?

(40) *Know-class predicates (Know, find out, remember, be certain...)*

- a. ?Who does Mary know whether to invite?⁶¹
- b. *How does Mary know whether to behave?
- c. *How tall does Mary know whether to be?

- d. ?Which problem do you know how to solve?
- e. *How do you wonder which problem to solve?
- f. *How high do you wonder who to lift?

How about predicates belonging to the *surprise* class, i.e. the class of weakly exhaustive predicates? Unfortunately, these examples do not offer a good testing ground for *wh*-islands, because the meaning of these question embedding predicates (*surprise*, *predict*) seems to be incompatible with an embedded infinitival clause. However, since tense in

⁶¹ The acceptability of this example shows speaker variation, and also variation across languages. Its French counterpart I am told seems to be consistently unacceptable, while its Hungarian counterpart is acceptable.

the embedded complement turns weak islands into strong islands, we cannot find weak-islands created by such weakly exhaustive predicates.

- (41) A. *Which problem did John **predict** how to solve?
b. *How did John **predict** which problem to solve?
c. *How high did John **predict** who to lift?

Therefore, it seems to me that all the examples that we find with *wh*-islands are in fact cases where the question embedding verbs requires a strongly exhaustive reading. In the next sections of this chapter I offer an analysis for the question embedding predicates *know* and *wonder*, which I will assume can be generalized in a straightforward manner to the other predicates in their class. I will first discuss the analysis for the *know*-type verbs, which I will later extend to the *wonder* class predicates. Sections 3 are concerned with degree questions, while in section 4 I will discuss manner questions about manners.

3. Wh-islands that arise with degree questions

In this section I will look at *wh*-islands that arise with degree questions. In the first part I will be concerned with embedded *whether* questions: first I will discuss examples with the question embedding predicate *know*, and then turn to examples with question embedding predicates from the *wonder* class. I will assume that the explanation given for these two verbs will carry over to all the other question embedding predicates in their class. In the second half of the section I discuss the case of embedded constituent questions and show that the problem they pose can in fact be reduced to the same problem that made embedded *whether* questions unacceptable in the first place.

3.1. Embedded whether questions

In the first part of this section I will discuss why embedded *whether* questions give rise to ungrammaticality when we try to extract degree constituents out of them. After briefly reviewing the lexical semantics of *know*, I will first examine the acceptable question with individuals and then turn to the unacceptable questions with degrees. I will also show that

the analysis offered for the *know*-class predicates can be generalized for *wonder* type predicates.

3.1.1 *Know*-class predicates

Our earlier description of the lexical semantics of the question embedding verb *know* could be equivalently expressed as follows, using a Hintikka-style semantics for attitude verbs:

(42) **know** (w) (x, $Q_H(w)$) is true iff

$\forall p \in Q_H(w)$, x knows whether p is true in w

where, using a Hintikka-style semantics for attitude verbs

‘x knows whether p is true in w’ is true in w iff

for $\forall w' \in \text{Dox}_x(w)$,

if $p(w)=1$, p in w’

and

if $p(w)=0$, $\neg p$ in w’

, where $\text{Dox}_x(w) = \{w' \in W : x\text{'s beliefs in } w \text{ are satisfied in } w'\}$

What the lexical entry above expresses the intuition that to know whether p is true just in case if in every world in which x’s desires are satisfied, if p is true in the actual world, x knows that p, and if p is not true, x knows that p is not true. Recall our earlier discussion about strong exhaustive interpretation of embedded questions. This is manifested above by the fact that *know* places constraints on the question complement, including the false alternatives.

3.1.2 Embedded whether questions with *know*-predicates about individuals

With the discussion in the previous section in mind, let’s look at a case with movement out of a whether clause. Recall the example discussed in the previous section, repeated below:

- (43) a. Who does Mary know whether she should invite?
 b. $\lambda q. \exists x [\text{person}(x) \wedge q = \lambda w. \text{knows}(\text{Mary}, \lambda p. [p = \lambda w'. \text{she}_m \text{ should invite } x \text{ in } w' \vee p = \lambda w'. \text{she}_m \text{ should not invite } x \text{ in } w']) \text{ in } w$

A simplified schematic illustration of the set of propositions that (43)b describes is given (44), assuming that the domain of individuals in the discourse is {Bill, John, Fred}⁶²:

- (44) {that Mary knows whether to invite Bill,
 that Mary knows whether to invite John,
 that Mary knows whether to invite Fred}

Given the lexical meaning of *know* and the discussion above, we might represent the set of propositions that (43)b and (44) describes as:

- (45) $\{ \forall w' \in \text{Dox}_M(w), (\text{if } \text{inv}B \text{ in } w, \text{inv}B \text{ in } w') \wedge (\text{if } \neg \text{inv}B \text{ in } w, \neg \text{inv}B \text{ in } w'),$
 $\forall w' \in \text{Dox}_M(w), (\text{if } \text{inv}J \text{ in } w, \text{inv}J \text{ in } w') \wedge (\text{if } \neg \text{inv}J \text{ in } w, \neg \text{inv}J \text{ in } w'),$
 $\forall w' \in \text{Dox}_M(w), (\text{if } \text{inv}F \text{ in } w, \text{inv}F \text{ in } w') \wedge (\text{if } \neg \text{inv}F \text{ in } w, \neg \text{inv}F \text{ in } w') \}$

, where $\text{inv}X \text{ in } w$ is a notational shorthand for *Mary should invite X in w*

A complete answer to Q (Ans2), as discussed in Chapter 1, is the assertion of a proposition in Q together with the negation of all the remaining alternatives in Q. In the case of a question such as (43), the meaning we would get if we negate one of the propositions in its denotation is shown below:

- (46) Mary does not know whether to invite John
 $\neg [\forall w' \in \text{Dox}_M(w), (\text{if } \text{inv}J \text{ in } w, \text{inv}J \text{ in } w') \wedge (\text{if } \neg \text{inv}J \text{ in } w, \neg \text{inv}J \text{ in } w')]$
 =
 $\exists w' \in \text{Dox}_M(w), (\text{inv}J \text{ in } w \wedge \neg \text{inv}J \text{ in } w') \vee (\neg \text{inv}J \text{ in } w \wedge \text{inv}J \text{ in } w')$

Let's imagine now that we assert *Mary knows whether she should invite Bill* as an answer to the question in (43). The statement that this answer is the complete answer means that we in fact assert that the rest of the alternative propositions in Q are false: i.e. we assert that Mary knows whether she should invite Bill and that she does not know whether she should invite John and that she does not know whether she should invite Fred:

(47) *Mary knows whether she should invite Bill*

$\forall w' \in \text{DOX}_M(w)$, if $\text{inv}B$ in w , $\text{inv}B$ in $w' \wedge$ if $\neg\text{inv}B$ in w , $\neg\text{inv}B$ in w'

and

$\exists w' \in \text{DOX}_M(w)$, $(\text{inv}J$ in $w \wedge \neg\text{inv}J$ in $w') \vee (\neg\text{inv}J$ in $w \wedge \text{inv}J$ in $w')$,

And

$\exists w' \in \text{DOX}_M(w)$, $(\text{inv}F$ in $w \wedge \neg\text{inv}F$ in $w') \vee (\neg\text{inv}F$ in $w \wedge \text{inv}F$ in $w')$

In the case of questions about individuals thus no problem arises with complete answers: the meaning expressed above is a coherent one. This is because the truth of the alternatives in the question denotation is independent from each other: whether or not Bill is invited in the actual world is completely independent from whether or not Fred is invited etc.

However, in the next sections I will show that in the case of questions about degrees and manners the situation is different. The problem will arise from the fact that the alternatives to these questions are not independent from each other: the truth certain alternatives will automatically have consequences for the truth of certain other alternatives, even if these are not entailed.

3.1.3 Embedded *whether* questions with *know* about degrees

This section argues that given the assumption introduced in chapter 3 according to which degree questions range over intervals, any complete answer to a question such as the one below will lead to a contradiction:

⁶² I restrict my attention to singular alternatives in the discussion. The reader can verify that adding plural alternatives would not change the facts.

(48) *How tall does Mary know whether to be?

Let's review briefly the interval account to degree questions. Following the analyses of Schwarzschild and Wilkinson (2002), and (partly) Heim (2006), I have assumed that degree adjectives establish a relation between individuals and intervals:

- (49) a. $\llbracket \text{tall} \rrbracket = \lambda I_{\langle d, t \rangle} . \lambda x_e . x \text{'s height} \in I$
 b. A set of degrees D is an interval iff
 For all d, d', d'' : if $d \in D \ \& \ d'' \in D \ \& \ d \leq d' \leq d''$, then $d' \in D$

Given this assumption, a sentence such as *John is tall* denotes the following:

(50) $\llbracket \text{John is } I\text{-tall} \rrbracket = 1$ iff John's height $\in I$; *where I is an interval*:

Let's look at a positive degree question, such as the one below. Recall the assumption that we are looking for the most informative true proposition among the question alternatives. The alternative propositions in this case range over different intervals that could be the argument of the adjective:

(51) $\llbracket \text{How tall is John?} \rrbracket^w$
 $= \lambda p . \exists I [I \in D_I \wedge p = \lambda w' . \text{John's height} \in I \text{ in } w']$
 'For what interval I , John's height is in that interval?'

Given this, the Hamblin denotation of (48) will be as shown below:

(52) a. How tall does Mary know whether to be?
 b. $\lambda q . \exists I [I \in D_I \wedge q = \lambda w . \text{knows} (\text{Mary}, \lambda p . [p = \lambda w' . \text{her}_m \text{ height}$
 $\text{be in } I \text{ in } w' \vee p = \lambda w' . \neg \text{her}_m \text{ height be in } I \text{ in } w'])$ in w

Informally, we might represent the set described above as follows:

- (53) { that Mary knows whether her height be in I_1 ,
 that Mary knows whether her height be in I_2 ,
 that Mary knows whether her height be in I_3 ,
 etc, for all intervals in D_I }

This set might be described more precisely as follows: (Notice that if one knows whether her height is not in an interval I equals her knowing about her height being in the complement of that interval, which I represent as $\neg I$)

- (54) $\{\forall w' \in \text{Dox } M(w), [\text{if } I_1(w)=1, I_1(w')=1] \wedge [\text{if } \neg I_1(w)=1, \neg I_1(w')=1]$
 $\forall w' \in \text{Dox } M(w), [\text{if } I_2(w)=1, I_2(w')=1] \wedge [\text{if } \neg I_2(w)=1, \neg I_2(w')=1]$
 $\forall w' \in \text{Dox } M(w), [\text{if } I_3(w)=1, I_3(w')=1] \wedge [\text{if } \neg I_3(w)=1, \neg I_3(w')=1] \}$
 ,where $I_n(w)$ is a notational shorthand for *Mary's height should be in I_n in w .*

Imagine now that we were to state *Mary knows whether her height should be in I_1* as a complete answer. A complete answer equals to the assertion of the most informative true answer together with the negation of all the alternatives that are not entailed by the most informative true answer. Now let's take 3 intervals: interval 1, interval 2 which is fully contained in 1 and interval 3 which is fully contained in the complement of 1:

- (55) | 1 _____ | $\neg 1$ _____ |
 | 2 _____ | $\neg 2$ _____ |
 | $\neg 3$ _____ | 3 _____ |

The propositions that Mary knows whether her height is in I_1 and that Mary knows whether her height is in I_2 and that Mary knows whether her height is in I_3 do not entail each other. Given this, asserting that *Mary knows whether her height be in I_1* as a

complete answer would amount to asserting the conjunction that she knows whether her height should be in I_1 and that she does not know whether her height should be in I_2 or I_3 :

$$(56) \quad \forall w' \in \text{Dox } M(w), [\text{if } I_1(w)=1, I_1(w')=1] \wedge [\text{if } \neg I_1(w)=1, \neg I_1(w')=1]$$

and

$$\exists w' \in \text{Dox } M(w), (I_2(w)=1 \wedge \neg I_2(w') \neq 1) \vee (\neg I_2(w)=1 \wedge \neg I_2(w') \neq 1)$$

and

$$\exists w' \in \text{Dox } M(w), (I_3(w)=1 \wedge \neg I_3(w') \neq 1) \vee (\neg I_3(w)=1 \wedge \neg I_3(w') \neq 1)$$

However, the problem is that the meaning expressed by the tentative complete answer above is not coherent. Suppose first that Mary's height is in I_1 . Then the relevant parts of the complete answer will be the ones in boldface:

$$(57) \quad | \mathbf{1} \text{ } \mathbf{d}_M \text{ } | \neg 1 \text{ } |$$

$$| \mathbf{2} \text{ } | \neg 2 \text{ } |$$

$$| \neg 3 \text{ } | 3 \text{ } |$$

$$(58) \quad \forall w' \in \text{Dox } M(w), [\text{if } \mathbf{I_1(w)=1, I_1(w')=1}] \wedge [\text{if } \neg I_1(w)=1, \neg I_1(w')=1]$$

and

$$\exists w' \in \text{Dox } M(w), (I_2(w)=1 \wedge \neg I_2(w') \neq 1) \vee (\neg I_2(w)=1 \wedge \neg I_2(w') \neq 1)$$

and

$$\exists w' \in \text{Dox } M(w), (I_3(w)=1 \wedge \neg I_3(w') \neq 1) \vee (\neg \mathbf{I_3(w)=1} \wedge \neg \mathbf{I_3(w') \neq 1})$$

The complete answer states that Mary does not know that her height is in $\neg I_3$, i.e. the complement of interval I_3 . From this it follows, that for any interval contained in I_3 , Mary does not know that her height is in it. Interval I_1 is contained in interval $\neg I_3$. But now we have derived that the complete answer states a contradiction: this is because it states that Mary knows that her height is in I_1 **and** that she does not know that her height is in $\neg I_3$,

which is a contradiction. We might illustrate the contradiction that arises with the following:

(59) #Mary knows whether her height is btw 0 and 5 or between 5 and 10

But

She does not know whether her height is btw 0 and 3 or between 3 and 10

And

She does not know whether her height is btw 0 and 7 or between 7 and 10

Suppose now that Mary's height has to be in the complement of interval I_1 : the same problem is recreated, but this time with interval 2:

(60) | 1 _____ | $\neg 1$ **d_M** _____ |
 | 2 _____ | $\neg 2$ _____ |
 | $\neg 3$ _____ | 3 _____ |

(61) $\forall w' \in \text{Dox } M(w), [\text{if } I_1(w)=1, I_1(w')=1] \wedge [\text{if } \neg I_1(w)=1, \neg I_1(w')=1]$

and

$\exists w' \in \text{Dox } M(w), (I_2(w)=1 \wedge \neg I_2(w') \neq 1) \vee (\neg I_2(w)=1 \wedge \neg I_2(w') \neq 1)$

and

$\exists w' \in \text{Dox } M(w), (I_3(w)=1 \wedge \neg I_3(w') \neq 1) \vee (\neg I_3(w)=1 \wedge \neg I_3(w') \neq 1)$

The complete answer states that Mary does not know that her height is in $\neg I_2$, i.e. the complement of interval I_2 . From this it follows, that for any interval contained in I_2 , Mary does not know that her height is in it. Interval $\neg I_1$ is contained in interval $\neg I_2$. But now again we have derived that the complete answer states a contradiction: this is because it states that Mary knows that her height is in I_1 and that she does not know that her height is in $\neg I_3$, which is a contradiction.

3.1.4 Embedded whether questions with *wonder* –type predicates about degrees

As a first pass, let's assume (cf. e.g. Lahiri (2002), Guerzoni and Sharvit (2004)), that the lexical semantics of *wonder* is the following:

- (62) **wonder** (w) (x, $Q_H(w)$) is true, iff for all p in $Q_H(w)$
x wants to know whether p is true or false in w.

We might state, somewhat informally, that for any individual x and any question Q, *x wonders Q* means “x wants to know the answer to Q”, in other words, x wants to know which propositions in Q are true in w. The statement then that *x wonders Q* is the report of an “internal/mental” questioning act of x's. Guerzoni and Sharvit (2004) notice that support to the view of *wonder* as an ‘internal’-speech act report comes from languages where the only equivalent to *x wonders Q*, is literally *x asks oneself Q* (e.g. French *se demander*, Italian *chiedersi/domandarsi* etc.) More precisely, we might say that wondering about p conveys that (a) it is not the case that x is opinionated about all p in $Q_H(w)$, and (b) for all p in $Q_H(w)$, x would prefer being opinionated about p. This in fact the meaning that Guerzoni and Sharvit (2004) assign to *wonder*:

- (63) **wonder** (w) (x, $Q_H(w)$) is defined iff
 $\neg \forall p \in Q_H(w), x \text{ believe } p$
if defined, **wonder** (w) (x, $Q_H(w)$) is true iff
 $\forall p \in Q_H(w), x \text{ wants-to-know whether } p \text{ in } w$

Let's spell out what it means if *x wants to know whether p*. Using a Hintikka-style semantics for attitude verbs such a meaning could be expressed as follows:

- (64) ‘x *wants-to-know* whether p in w ’ is **true** in w iff
for $\forall w' \in \text{Bul}_x(w)$,
if $p(w)=1$, x knows p in w'
and
if $p(w)=0$, x knows $\neg p$ in w'

,where $Bul_x(w) = \{w' \in W : x\text{'s desires in } w \text{ are satisfied in } w'\}$
 ‘in every world in which x ’s desires are satisfied, if p , x knows that p
 and if not p x knows that not p ’

Given this meaning, the meaning of question such as the one in (65) will be as follows:

- (65) a. *How tall does Mary wonder whether to be?
 b. $\lambda q. \exists I [I \in D_1 \wedge q = \lambda w. \text{wonders (Mary, } \lambda p. [p = \lambda w'. \text{her}_m \text{ height}$
 $\text{be in } I \text{ in } w' \vee p = \lambda w'. \neg \text{her}_m \text{ height be in } I \text{ in } w')]$ in w

Informally, we might represent the set described above as follows:

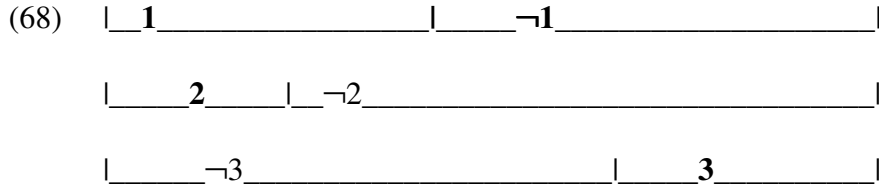
- (66) { that Mary wonders whether her height should be in I_1 ,
 that Mary wonders whether her height should be in I_2 ,
 that Mary wonders whether her height should be in I_3 ,
 etc, for all intervals in D_1 }

Somewhat more precisely we might represent it as below (Notice that if one wonders whether her height is not in an interval I equals her wondering about her height being in the complement of that interval, which I represent as $\neg I$)

- (67) { $\forall w' \in Bul_M(w)$, if I_{1w} , M knows I_1 in w' \wedge if $\neg I_{1w}$, M knows $\neg I_1$ in w' ,
 $\forall w' \in Bul_M(w)$, if I_{2w} , M knows I_2 in w' \wedge if $\neg I_{2w}$, M knows $\neg I_2$ in w' ,
 $\forall w' \in Bul_M(w)$, if I_{3w} , M knows I_3 in w' \wedge if $\neg I_{3w}$, M knows $\neg I_3$ in w' ,
 etc. for all intervals in D_1 }

,where I_{nw} is a notational shorthand for *Mary’s height should be in I_n in w* .

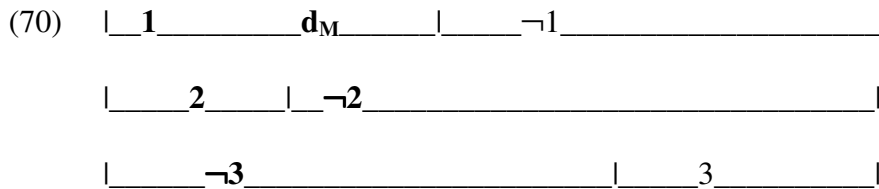
Imagine now that we were to state *Mary wonders whether her height should be in I_1* as a complete answer. Now let's take 3 intervals as follows: interval 1, interval 2 which is fully contained in 1 and interval 3 which is fully contained in the complement of 1:



Asserting that *Mary wonders whether her height should be in I_1* as a complete answer would amount to asserting the conjunction that she wonders whether her height should be in I_1 and that she does not wonder whether her height should be in I_2 or I_3 :

- (69) $\forall w' \in \text{Bul}_M(w)$, if I_{1w} , M knows I_1 in $w' \wedge$ if $\neg I_{1w}$, M knows $\neg I_1$ in w' ,
and
 $\exists w' \in \text{Bul}_M(w)$, $(I_{2w} \wedge M \neg\text{know } I_2 \text{ in } w') \vee (\neg I_{2w} \wedge M \neg\text{know } \neg I_2 \text{ in } w')$
and
 $\exists w' \in \text{Bul}_M(w)$, $(I_{3w} \wedge M \neg\text{know } I_3 \text{ in } w') \vee (\neg I_{3w} \wedge M \neg\text{know } \neg I_3 \text{ in } w')$

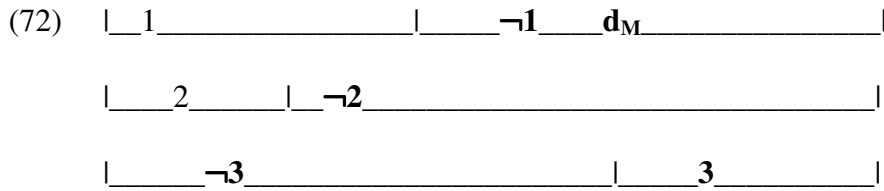
However, again the meaning expressed by the tentative complete answer above is not coherent. Suppose first that Mary's height is in I_1 . Then the relevant parts of the complete answer will be the ones in boldface:



- (71) $\forall w' \in \text{Bul}_M(w)$, if I_{1w} , M knows I_1 in w' \wedge if $\neg I_{1w}$, M knows $\neg I_1$ in w' ,
and
 $\exists w' \in \text{Bul}_M(w)$, $(I_{2w} \wedge M \neg\text{know } I_2 \text{ in } w') \vee (\neg I_{2w} \wedge M \neg\text{know } \neg I_2 \text{ in } w')$
and
 $\exists w' \in \text{Bul}_M(w)$, $(I_{3w} \wedge M \neg\text{know } I_3 \text{ in } w') \vee (\neg I_{3w} \wedge M \neg\text{know } \neg I_3 \text{ in } w')$

The complete answer states that in her desire worlds, Mary does not know that her height is in $\neg I_3$, i.e. the complement of interval I_3 . From this it follows, that for any interval contained in I_3 , Mary does not know that her height is in it. Interval I_1 is contained in interval $\neg I_3$. But now we have derived that the complete answer states a contradiction: this is because it states that Mary wants to know that her height is in I_1 **and** that she does not want to know that her height is in $\neg I_3$, which is a contradiction.

Suppose now that Mary's height has to be in the complement of interval I_1 : the same problem is recreated, but this time with interval 2:



(73) $\forall w' \in \mathbf{Bul}_M(w)$, if I_{1w} , M knows I_1 in w' \wedge if $\neg I_{1w}$, M knows $\neg I_1$ in w' ,

and

$\exists w' \in \mathbf{Bul}_M(w)$, ($I_{2w} \wedge M \neg \mathbf{know} I_2$ in w') \vee ($\neg I_{2w} \wedge M \neg \mathbf{know} \neg I_2$ in w')

and

$\exists w' \in \mathbf{Bul}_M(w)$, ($I_{3w} \wedge M \neg \mathbf{know} I_3$ in w') \vee ($\neg I_{3w} \wedge M \neg \mathbf{know} \neg I_3$ in w')

The complete answer states that Mary does not want to know that her height is in $\neg I_2$, i.e. the complement of interval I_2 . From this it follows, that for any interval contained in I_2 , Mary does not want to know that her height is in it. Interval $\neg I_1$ is contained in interval $\neg I_2$. But now we have derived that the complete answer states a contradiction: this is because it states that Mary wants to know that her height is in I_1 **and** that she does not want to know that her height is in $\neg I_3$, which is a contradiction.

We might again illustrate the contradiction that arises with the following:

- (74) #Mary wants to know whether her height is btw 0 and 5 or between 5 and 10
 But
 She does not want to know whether her height is btw 0 and 3 or between 3 and 10
 And
 She does not want to know whether her height is btw 0 and 7 or between 7 and 10

Interestingly, we might notice that for both false alternatives, it would have been consistent with the meaning of *p* to exclude them, but trying to exclude them both at the same time leads to contradiction. Notice the interesting fact that this property again connects in a straightforward way to the generalization made in Fox (2007) about non-exhaustifiable sets of alternatives, reviewed in Chapter 2.

3.2. Embedded constituent questions

Not only embedded whether-constituents, but also embedded *whether* questions are *wh*-islands, as the examples below show:

- (75) A. ?Which problem does Mary know how to solve?
 b. *How tall does Mary know who should be?

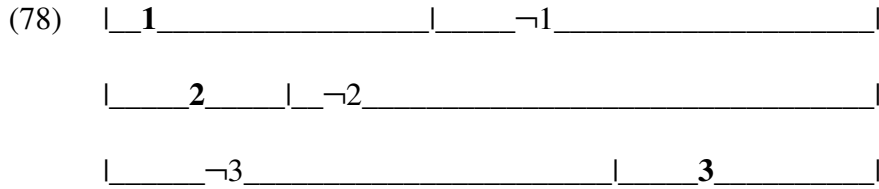
The unacceptability of (75)b and similar questions can be reduced to the problem that lead to the unacceptability of embedded whether questions in the previous section. First, observe that the Hamblin-denotation of (75)b is as below:

- (76) $\lambda q. \exists I [I \in D_1$
 $\wedge q = \lambda w. \text{knows} (\text{Mary}, \lambda p. \exists x [p = \lambda w'. x \text{'s height should be in } I \text{ in } w']) \text{ in } w$

Informally, the meaning above might be schematized as below:

- (77) {that Mary knows about Q_1 ,
 that Mary knows about Q_2 }

Imagine that there are 2 problems in the domain A, B and C, and 3 intervals: interval 1, interval 2 which is fully contained in 1 and interval 3 which is fully contained in the complement of 1, as above.



Then the informal representation of the denotation of the question above could be as follows:

- (79) { that Mary knows (for which $x \in \{A,B,C\}$, x 's height is in I_1)
 that Mary knows (for which $x \in \{A,B,C\}$, x 's height is in I_2)
 that Mary knows (for which $x \in \{A,B,C\}$, x 's height is in I_3) }

- (80) { that Mary knows {whether A's height is in I_1 , B's height is in I_1 , C's height is in I_1 }
 that Mary knows {whether A's height is in I_2 , B's height is in I_2 , C's height is in I_2 }
 that Mary knows {whether A's height is in I_2 , B's height is in I_2 , C's height is in I_2 } }

Recall that the strongly exhaustive meaning for the question embedding predicate *know* places a constraint on the true as well as the false alternatives, as repeated below:

- (81) 'x know whether p' is **true** in w iff
 for $\forall w' \in \text{Dox}_x(w)$,
 if $p(w)=1$, p in w'
 and
 if $p(w)=0$, $\neg p$ in w'
 ,where $\text{Dox}_x(w) = \{w' \in W: x\text{'s beliefs in } w \text{ are satisfied in } w'\}$

Given this lexical meaning for *know*, our question denotation equals the following set of propositions:

- (82) { that M.knows { whether A's height $\in I_1$; whether B's height $\in I_1$; whether C's height $\in I_1$ },
that M.knows { whether A's height $\in I_2$; whether B's height $\in I_2$; whether C's height $\in I_2$ },
that M.knows { whether A's height $\in I_3$; whether B's height $\in I_3$; whether C's height $\in I_3$ } }

Before we proceed, let me insert here a note about negation: It has been already observed that the negation of a strongly exhaustive predicate is stronger than expected: *John does not know who came*, seems to suggest that for no individual does John know whether they came. This is surprising because by simple negation we would only expect a much weaker meaning, according to which John does not know for everyone whether they came. In other words,

- (83) John does not know who came

seems to mean:

- (84) $\forall p \in Q_H(w)$, John does not know whether p

instead of the weaker:

- (85) $\neg \forall p \in Q_H(w)$, John knows whether p

In the discussion that follows, I will take this fact at face value, without providing an explanation. (cf. an attempt to derive this effect based on a homogeneity presupposition associated with a plurality of propositions that is the embedded question in Fox (2007, class handouts))

I propose now that the complete answer, which is a conjunction of maximally true answer together with the negation of the false alternatives in fact respects the observation made about negation above. In other words, it seems that the complete answer conjoins

the most informative true answer with the strengthened negation of the false alternatives.
 Now, a complete answer *Mary knows who should be I₁-tall* will state:

- (86) { **that M.knows whether A's height $\in I_1$**
 & M knows whether B's height $\in I_1$
 & *M knows C's height $\in I_1$,*
that M. \neg know whether A's height $\in I_2$
 & M \neg know whether B's height $\in I_2$
 & *M \neg know whether C's height $\in I_2$,*
that M \neg know whether A's height $\in I_3$
 & M \neg know whether B's height $\in I_3$
 & *M \neg know whether C's height $\in I_3$ }*

Looking more closely at the set of propositions above, we can observe that exactly the same problem that arose with the embedded *whether* questions is recreated, but multiply! Observe that each boxed part below corresponds to an embedded contradictory *whether* question:

- (87) *Mary knows who should be I₁-tall*

{ that M.knows_ whether A's height $\in I_1$ that M. \negknow whether A's height $\in I_2$ that M \negknow whether A's height $\in I_3$	& <u>that M knows whether B's height $\in I_1$</u> & <u>that M \neg know whether B's height $\in I_2$</u> & <u>that M \neg know whether B's height $\in I_3$</u>	& <i>that M knows whether C's height $\in I_1$,</i> & <i>that M \negknow whether C's height $\in I_2$</i> & <i>that M \negknow whether C's height $\in I_3$</i>
---	---	--

We can observe then that the problem of embedded constituent questions simply reduces to the problem of embedded *whether* questions, which have been argued to always lead to a contradiction in the previous section.

4. Manners

In this section I will look at manner questions such as the one below:

(88) *How does Mary wonder whether she should behave?

Before we proceed, recall the assumptions about the domain of manners that was presented in Chapter 3, namely that the domain of manners contains *contraries*: this stated that every manner predicate has at least one contrary in the domain of manners:

(89) Manners denote functions from events to truth values. The set of manners (D_M) in a context C is a subset of $[\{f \mid E \rightarrow \{1,0\}\} = \wp(E)]$ such that for each predicate of manners $P \in D_M$, there is at least one contrary predicate of manners $P' \in D_M$, such that P and P' do not overlap: $P \cap P' = \emptyset$.

The second assumption that was made concerned the range of admissible domains. It was argued that although the context might implicitly restrict the domain of manners, just as the domain of individuals, but for any manner predicate P , its contrary predicates will be alternatives to it in any context.

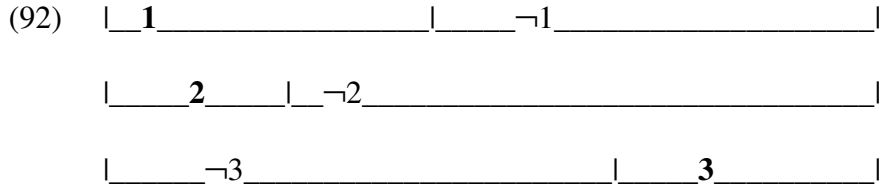
(90) {wisely, unwisely, etc...}

Finally, it was proposed that that the law of excluded middle does not hold for manners:

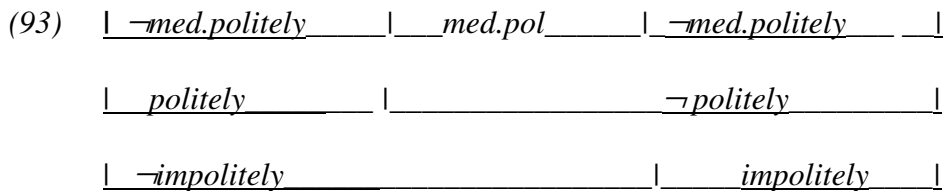
(91) for each pair (P, P') , where P is a manner predicate and P' is a contrary of P , and $P \in D_M$ and $P' \in D_M$, there is a set of events $P^M \in D_M$, such that for every event e in $P^M \in D_M$ [$e \notin P \in D_M$ & $e \notin P' \in D_M$].

We might first observe now that unfortunately, the account proposed for degree questions above does not go through in a straightforward way for manner questions: Recall that the problem with degree questions was that it was always possible to find 3 intervals in the

domain of intervals, such as intervals I_1, I_2, I_3 below, such that interval I_1 was covered by $\neg I_3$ and interval $\neg I_1$ was covered by interval $\neg I_2$:



In analogy with the intervals that we have used for degrees, we might think of contrary manner predicates as exclusive sets of events. Suppose now that the domain manners contains three exclusive sets of events, i.e. three contrary predicates, e.g. the *politely*, *impolitely*, and *neither politely and impolitely*, which I represent as *med-politely* below. Now, the sets of events that are politely-events and the events that are in the complement set of *politely* events, the sets of events that are *impolitely*-events and the events that are in the complement set of *impolitely* events and the sets of events that are *med-politely*-events and the events that are in the complement set of *med-politely* events can be represented as follows:



Given this structure, a complete answer to a manner question below, e.g. You know whether to behave politely, will not be a contradiction:

(94) *How does Mary know whether to behave?

Recall first from the previous section that denotation that we have derived for the question above was as follows:

(95) $\lambda q. \exists \alpha [manner(\alpha) \wedge q = \lambda w. \text{knows}(\text{Mary}, \lambda p. [p = \lambda w'. she_m \text{ behave in } \alpha \text{ in } w' \vee p = \lambda w'. she_m \text{ not behave in } \alpha \text{ in } w']) \text{ in } w]$

Assuming that our domain of manners is $\{\textit{politely}, \textit{impolitely}, \textit{med-politely}\}$, we might informally represent this set as below:

- (96) {that Mary wonders (whether to behave *politely*),
that Mary wonders (whether to behave *impolitely* ,
that Mary wonders (whether to behave *med-politely* , ...)}

A word of caution is in order. Notice that given this small domain, the set of alternatives is **not** the singular set:

- (97) {that M wonders (behave *politely*, behave *impolitely*, behave *med-politely*)}

This is because given the regular meaning of *whether*, (97) is simply not what we get compositionally. Given some proposition p , *whether p*, as defined in the previous section, gives us the set consisting of p and its complement proposition $\neg p$: i.e. $\{p, \neg p\}$. *Whether p* can not denote the set of propositions that we would get by replacing a manner predicate m “in” p by all the contraries to m in the domain, which is what (97) would amount to in this case. (But notice that (97) is the proper representation for the denotation of the grammatical question *Mary wonders how to behave?*) Also, if we had more manners in our domain, e.g. *wisely*, *unwisely*, on top of our previous domain, the set of propositions in the Hamblin-denotation of (88) would **not** be:

- (98) {that M wonders (whether to behave *politely*),
that M wonders (whether to behave *unwisely*)}

Instead, it would be:

- (99) {that Mary wonders (whether to behave *politely*),
that Mary wonders (whether to behave *impolitely*),
that Mary wonders (whether to behave *wisely*),

that Mary wonders (whether to behave *unwisely*),

*plus the coherent pluralities of manners that can be formed*⁶³:

that Mary wonders (whether to behave *impolitely+wisely*),

etc.}

Of course, this set seems a little bit strange, but that is part of the point being made here. By the rules of semantic composition we only get this strange set.

Given the discussion above, we might observe that the set of propositions in (96) denotes the following set:

- (100) $\{ \forall w' \in \text{Bul}_M(w), \text{if } b.Pol_w, M \text{ knows } b.Pol \text{ in } w' \wedge \text{if } \neg b.Pol_w, M \text{ knows } \neg b.Pol \text{ in } w',$
 $\forall w' \in \text{Bul}_M(w), \text{if } b.ImPol_w, M \text{ knows } b.ImPol \text{ in } w' \wedge \text{if } \neg b.ImPol_w, M \text{ knows } \neg b.ImPol \text{ in } w',$
 $\forall w' \in \text{Bul}_M(w), \text{if } b.medPol_w, M \text{ knows } b.medPol \text{ in } w' \wedge \text{if } \neg b.medPol_w, M \text{ knows } \neg b.medPol$
in } w' \}

Where $b.Pol_w$ is a notational shorthand for Mary should behave politely, etc.

A complete answer such as Mary knows whether she should behave politely, will state the following:

- (101) $\{ \forall w' \in \text{Bul}_M(w), \text{if } b.Pol_w, M \text{ knows } b.Pol \text{ in } w' \wedge \text{if } \neg b.Pol_w, M \text{ knows } \neg b.Pol \text{ in } w'$
and
 $\exists w' \in \text{Bul}_M(w), (b.ImPol_w \wedge \neg M \text{ knows } b.ImPol \text{ in } w') \vee (\neg b.ImPol_w \wedge M \neg \text{knows } \neg b.ImPol \text{ in } w',$
 $\exists w' \in \text{Bul}_M(w), (b.medPol_w \wedge M \neg \text{knows } b.medPol \text{ in } w') \vee (\neg b.medPol_w \wedge M \neg \text{knows } \neg b.medPol$
in } w' \}

If Mary has to behave politely, than her behavior will also be not impolite and not medium polite, therefore in her desire worlds if the event was a politely-event Mary will

⁶³ Recall from Chapter 3 that it is a presupposition on forming plural manner predicates $\{p_1, p_2\}$ that $p_1 \cap p_2 \neq \emptyset$. (cf. also Spector (2007), Szabolcsi and Haddican (2005) on a related point)

(1) #John did not reply wisely and unwisely

know that it was not an impolitely-event and not a med-politely event, in other words it would be inconsistent for Mary to know that the event was polite, but not to know that it was also not-impolite and not-medium polite. As a consequence, it is not consistent with the complete answer that the event be polite. However, if the event in question is not a polite one, this is still consistent with it not being impolite (as it might be medium polite) and with it not being medium polite (as it might be impolite). Therefore, it will be coherent for Mary to know that the event was not polite, but not know whether it was impolite or medium polite:

(102) $\lfloor \neg \text{med.politely} \quad \mid \quad \text{med.pol} \quad \mid \quad \neg \text{med.politely} \quad \rfloor$
 $\lfloor \quad \text{politely} \quad \mid \quad \neg \text{politely} \quad \rfloor$
 $\lfloor \quad \neg \text{impolitely} \quad \mid \quad \text{impolitely} \quad \rfloor$

Therefore, unlike what we have seen about manner questions, the complete answer above does not state a contradiction. However, we still might observe something unusual. While this complete answer is not contradictory, it is nevertheless contextually equivalent to its counterpart with an embedded declarative:

(103) Mary knows that she should not behave impolitely.

This is because, as we have seen above, polite behavior would have resulted in an inconsistent state of desires, but impolite behavior would not have. It is easy to see, that given our earlier assumptions about the domain of contraries this observation generalizes to any complete answer to the question. However, now we might say that the problem with the question is that all of its complete answers are contextually equivalent to sentences which have a stronger presupposition, and therefore the question itself will be ruled out as violation of the principle of Maximize presupposition⁶⁴. This is because a complete answer such as (104) stands with a vacuous presupposition, but its counterpart with an embedded declarative stands with a contentful presupposition:

(104) Mary knows whether to behave politely. (vacuous presupposition: $p \vee \neg p$)

(105) Mary knows that she should not behave politely (presupposition: $\neg p$)

Roughly speaking, the principle of Maximize presupposition! requires that if we have two alternatives which are contextually equivalent, but one of them comes with a stronger presupposition, we are required to use the with the stronger presupposition. (But cf. Heim (1991), Sauerland (2003), Percus (2006), Schlenker (2008) for a number of different ways of spelling out this principle in a more precise fashion.) Given this principle, any complete answer to our question will be ruled out in a systematic way as a violation of the principle of Maximize presupposition. Finally, we can say that for any question, if we are in a position to know in advance that every complete answer to it will be ruled out, then the question is infelicitous.

In the case of question embedding predicates such as *wonder*, the situation is again a bit different. This is because question embedding predicates such as *wonder* cannot in fact embed a declarative clause, as it is shown in the example below:

- (106) *How do you wonder whether to solve the problem?
- a. I wonder whether you should solve this problem fast
 - b. #I wonder that you should solve this problem fast

Therefore, although the meaning of the complete answer is still predicted to be contextually equivalent to a sentence with an embedded declarative, the embedded declarative is independently unacceptable and the explanation for the unacceptability of the question in (106) cannot rely on the principle of maximize presupposition. However, I would like to suggest that now the problem with the complete answer is in fact the same that makes it impossible for question-embedding predicates such as *wonder* to take declarative complements: If, as it was argued above in Section 3.1.4, it is the essential part of the lexical meaning of *wonder* type verbs that they express a mental questioning act, a declarative complement (or a complement that is contextually equivalent to

⁶⁴ I am indebted to E. Chemla (pc) for this suggestion.

declarative one) is simply incompatible with the lexical meaning of *wonder*. It is for this reason then, that both the embedded declarative, as well any complete answer to (106) above is unacceptable.

5. Conclusion

In this chapter I have argued that *wh*-islands are unacceptable because they cannot have a complete (exhaustive) answer. In the case of degree question, the complete answer was shown to express a contradiction, given the assumption introduced in Chapter 3 that degree questions range over intervals. In the case of manner questions the problem arose from the fact that a complete answer to these questions was predicted to be equivalent to a sentence with an embedded declarative, which was either a violation of the principle of Maximize presupposition!, as in the case of question embedding predicates such as *know*, or simply incompatible with the meaning of the question embedding predicate, which was argued to be the case with predicates such as *wonder*.

Chapter 6

Quantificational Interveners

1. Introduction

In this chapter, I will be concerned with weak island effects created by quantificational elements, such as the ones below:

- (1) How tall is **every boy**?
- (2) ???How much did **some girls** score?

- (3) How much milk have you **never** spilled on your shirt?
- (4) How much did **no one** score?

- (5) ???How did **few/less than 3 girls** behave at the party?
- (6) How did **only a few girls** behave at the party?
- (7) How did **at most 3 girls** behave at the party?

Some of the above examples (e.g. (4), (5)) have been traditionally discussed as examples of weak island violations (e.g. Rizzi (1990)), who proposed that operators that license NPI's are interveners. (The terminology sometimes used in the literature after Klima (1964) is affective operators, the more current terminology would be (Strawson) DE operators.) It has been noted however, that not all DE operators cause intervention on the

one hand, and on the other hand, that certain upward entailing quantifiers cause intervention as well.

Among the non-downward entailing quantifiers that cause intervention most prominent perhaps were the examples with universal quantifiers such as (1), made famous by Szabolcsi and Zwarts (1993) (cf. also de Swart (1992), Kiss (1993)). This question can be understood as a pair-list question, or asking for the unique number such that every boy read exactly that number. Yet there is a missing reading, with everyone taking narrow scope: The sentence cannot have the reading ‘what is the height such that every boy is tall to at least that degree?’.

A second set of data with upward entailing quantifiers consists of examples such as (8) and (9) below. These have been sometimes noted to cause intervention as well (e.g. in Honcoop (1998), and contra Szabolcsi and Zwarts (1993)), however, they were not grouped together with weak island creating environments, for the reason that questions about individuals seem to be sensitive to these environments as well, as shown by the examples from Honcoop (1998):

(8) ???How many children do **some women** have?

(9) ??How did **a man** behave?

(10) ??Which book did **a student** read?

(11) ??Which book did **3 students** read?

I will argue however that in fact the above examples belong to the present discussion as the oddness of even the examples with individuals might be argued to follow from maximalization failure.

As concerning the downward entailing quantifiers, while negative quantifiers such as *no one* are traditionally listed in the group of weak island creating operators, in fact in many contexts these seem to be perfectly acceptable. Similarly, Szabolcsi and Zwarts (1993) discusses the case of *at most* as in (7), noting that most people find it acceptable. Furthermore, it seems to me that there is also a marked difference btw. (5)

and (6), the latter being acceptable for most people, even though they both involve DE interveners.

The present chapter looks at the above cases of quantificational intervention, and shows that the approach argued for in this thesis makes a number of correct predictions for them. I will also point out however certain problems, in particular with quantifiers such as *few*, which the present analysis in fact predicts to be acceptable, fact. In the first part of the chapter I will provide a very brief introduction into the topic of the interpretation of quantifiers in questions—this discussion will by no means do justice to this extremely rich and complex topic, it is only meant to serve as a background to the issue of the problem of weak islands. In the second part of the chapter, I will turn to discussing what the present analysis predicts for the various quantifiers.

2. Quantifiers in questions

2.1 Functional readings, families of questions

Constituent questions that we have seen so far were of the kind where it was appropriate to give an answer which picks out an individual:

- (12) A: Who does every Englishman admire?
B: The Queen

- (13) $\lambda p.\exists x[\text{person}(x) \ \& \ p=\lambda w'.\forall y [\text{englishman}(y)\rightarrow \text{admires}(y,x) \text{ in } w']]$
'For which x , every Englishman likes x '

The H/K semantics only gives us the question meaning represented above. The reason why we only get this reading for (12) is that the existential quantifier in the interpretation of *who* will take wider scope than the universal quantifier in the sentence. Therefore this reading is also sometimes called the narrow scope reading of the question, meaning that the universal quantifier takes narrow scope.

However, there are two other possible types of readings of the question in (12) as indicated by the following possible answers:

- (14) B': His mother
 B'': Bill likes Mary, Jane likes Sue, etc

The first type of reading was discovered by Engdahl, who has showed that this reading cannot be represented if the question simply ranges over individuals as in (13) (cf. Engdahl (1986)). The reason is that the pronoun in (14) needs to get a bound reading, which is not possible to achieve with a representation such as the one above. Rather, in this case the question quantifies over functions from individuals to individuals (Skolem functions)⁶⁵:

- (15) a. For what f, every Englishman x loves f(x)
 b. $\lambda p \exists f [p = \lambda w'. \forall x [\text{englishman}(x) \rightarrow \text{loves}(x, f(x)) \text{ in } w']]$
 where f is variable of type $\langle e, e \rangle$
 c. $f_1 =$ Bill \rightarrow Bill's mother
 John \rightarrow John's mother
 Fred \rightarrow Fred's mother

The second type of reading is the so called pair-list reading, and is also referred to as the wide scope universal reading, as it is informally paraphrasable by '*For every Englishman x, who does x admire*'. However, as Engdahl (1986) and Chierchia (1993) have argued, the above representation does not in fact derive the right meaning. Instead, they argue that the 'wide scope' universal reading should be represented instead as a type of a functional question. According to a simple version of this analysis (indeed as we will see, too simple) the representation of the wide scope universal reading is exactly as above in (15), but the function f pairs individuals as shown below:

- (16) $f_1 =$ Bill \rightarrow Sue
 John \rightarrow Mary
 Fred \rightarrow Jane

⁶⁵ In earlier work, Engdahl and Reinhart have argued that these questions range over choice functions.

(17) $\forall x[\text{loves}(x, f_1(x)) = \text{love}(\text{Bill}, \text{Sue}) \& \text{love}(\text{John}, \text{Mary}) \& \text{love}(\text{Fred}, \text{Jane})]$

However, as Chierchia (1993) argues, this simple representation of the wide scope readings cannot be quite accurate either. I will only mention one problem here, and refer the reader to Chierchia's paper for the rest of the problems. This problem concerns DE quantifiers in questions. Interestingly, as noted in Groenendijk and Stokhof (1984) DE quantifiers in questions do not have list readings. Observe the example below.

- (18) A. Who do at most two boys like?
 b. $\lambda p \exists f [p = \lambda w'. \text{at most two people } (\lambda z. \text{loves}(x, f(x))) \text{ in } w']$

On this view, (18)b is the interpretation for (18)a. Suppose that we are considering a situation in which *a* loves *b* and *b* loves *a*. In this case the function below makes the proposition true:

- (19) $f_1 = \begin{matrix} a \rightarrow b \\ b \rightarrow a \end{matrix}$

However, the question in (18) does not have a list reading. Yet the simple version of deriving list readings with functional questions that was shown above does not offer an explanation as to why this should be.

Approaches that use a sophisticated version of quantifying into questions (e.g. Groenendijk and Stokhof (1984), Higginbotham (1981)) do appear however to predict the unavailability of list readings in (18). I will very briefly introduce the account in Groenendijk and Stokhof (1984). (I rely heavily on Chierchia (1993)'s rendering of Groenendijk and Stokhof (1984)'s notation) According to their view questions that contain quantifiers really denote a *family of questions*. E.g. the question below could be informally paraphrased as *Who do these two people like?*, *Who do those two people like?* *Etc.* :

- (20) a. Who do two people like?
 b. for two people, tell me who they like?

Recall that for Groenendijk and Stokhof (1984) a question denotes the following proposition:

- (21) Who does John love?
 $=\lambda w'.\lambda w''[\lambda x. \text{John loves } x \text{ in } w' = \lambda x. \text{John loves } x \text{ in } w'']]$

The relation above holds between w' and w'' just in case the set of people loved by John is the same in w' and w'' . Now, according to them, the question in (20) denotes a family of questions, i.e. sets of questions. For a question like *Who do two people like*, we want to form a set of questions, one for each minimal witness set⁶⁶ in *two people*.

- (22) $\lambda Q \exists A [W \text{ (two people, } A)]$
 $\& Q = \lambda w'.\lambda w''[\lambda x.\lambda y[x \in A \ \& \ x \text{ likes } y \text{ in } w' = \lambda x.\lambda y[x \in A \ \& \ x \text{ likes } y \text{ in } w'']]$
 Where 'W' stands for 'is a minimal witness of'

This family of questions (or set of questions) contains as many questions as there are groups of people. To answer such a family of questions is to answer any of its members.

Now in the case of DE quantifiers, their minimal witness set is the empty set. But then in the case of questions such as (18) the family of questions will only contain the empty set. In other words, such questions will not have an answer in any world, and they can be answered without saying anything at all. This correctly derives that list readings are unavailable in these cases. This is also true of Chierchia (1993) skolemized version of the G&S family of question reading:

⁶⁶ Barwise and Cooper (1981) have shown that each natural language quantifier \wp "lives on" set A. (A generalized quantifier \wp "lives on" set A iff for any set B, $B \in \wp \Leftrightarrow B \cap A \in \wp$) Let \wp_A be a quantifier that lives on A. Further, each quantifier has one or more "minimal witness sets". A minimal witness set for \wp_A is a $B \subseteq A$ such that $B \in \wp$ and for no $P' \subseteq B$, $P' \in \wp$. E.g. a minimal witness set for the (value of) two men is a set of exactly two men. No man has the empty set as their unique minimal witness set. In fact, DE quantifiers all have the empty set as their unique minimal witness set.

- (23) $\lambda Q \exists A [W \text{ (at most two people, A) } \& Q=\lambda p. \exists f \in [A \rightarrow X] \exists x \in A [p=\lambda w'. \text{ loves } (x, f(x)) \text{ in } w']]$

Again, the family of questions in (23) only contains the empty set, which reflects the fact that list readings are not available in these cases.

This concludes our extremely brief review of readings of quantifiers in questions, for further discussion see also Higginbotham and May (1981), Higginbotham (1991), Lahiri (1991), Szabolcsi (1997), Beghelli (1997), among others.

2.2. Quantifiers as weak island inducers

The first idea about quantificational intervention was that DE quantifiers cause intervention, but not UE (cf. Szabolcsi and Zwarts (1993), Rullmann (1995) e.g.). Therefore, the aim was to explain the pattern below:

- (24) #How many pounds do less than 2 boys weigh?
 (25) How many pounds does every boy weigh?

de Swart (1992) and Kiss (1993) however has challenged this view. They have argued, based on split constructions, that in fact all scopal elements cause intervention on the narrow scope reading of the intervening quantifiers. The real difference between DE and UE quantifiers is that for independent reasons, a wide scope (pair-list, family of questions) reading is not available for DE quantifiers in questions—as was shown above. (cf. Groenendijk and Stokhof (1984), Chierchia (1993)). Thus the observation was that the questions that contain a DE quantifier are ungrammatical because neither the wide scope (pair-list, family of questions), nor the narrow scope reading is available:

- (26) How many pounds do less than 2 boys weigh?
 (a) #‘For less than 2 boys x, how many pounds does each x weigh?’
 (b) #‘For what n, less than 2 boys weigh at least n?’

Since the unavailability of the wide scope reading with DE quantifiers could be explained as above (cf. Groenendijk and Stokhof (1984), Chierchia (1993)), the fact that it is still in need of explanation is why the narrow scope reading is unavailable.

The important observation then in de Swart (1992) and Kiss (1993) was that while the question (27), which contains the quantifier *every*, is grammatical, importantly it also does not have the narrow scope reading, i.e. the reading in (27)b. It does have the wide scope, (list, family of questions) reading, --which is correctly predicted by the approaches introduced in the previous section --and therefore the question as a whole is grammatical.

- (27) How many pounds does every boy weigh?⁶⁷
- a. 'For every boy x, how many pounds does x weigh?'
 - b. '#For what n, every boy weighs at least n?'

But we still need an explanation as to why the narrow scope is ruled out. Notice also the contrast with the question over individuals in (12), which has the narrow scope reading. The million dollar weak-island intervention question therefore is why the narrow scope reading is not available in degree questions. (A note to the reader: I will mainly discuss degree questions in this chapter, because it seems to me that with manner questions the facts are much less clear...)

2.3 Szabolcsi and Zwarts (1993)

Szabolcsi and Zwarts (1993) point out however that the proposal in de Swart (1992) according to which scopal items thus always create intervention (i.e. cannot have the narrow scope reading) seems to be too strong: they argue that e.g. indefinites and (non-factive) attitude verbs do not seem to cause intervention, i.e. allow for the narrow scope reading⁶⁸:

- (28) ??How did a boy behave?
(29) How do you want me to behave?

⁶⁷ Also 'What is the unique degree such that every boy weighs (exactly) that much?'

Szabolcsi and Zwarts (1993) attempt therefore at drawing a principled demarcation line between the scopal expressions that create intervention, and those that do not. Their explanation, based on algebraic semantics, was briefly reviewed in Chapter 2.

We might note however that as regards indefinites, the facts are not that clear: In fact Honcoop (1998) e.g. has already noticed that that questions with indefinites cannot really get a narrow scope reading either. He has argued however, that this is not a weak island effect, because questions about individuals seem to show a similar restriction, cf. (10) repeated from above below:

(30) ??Which book did **a student** read?

It seems that indeed the above facts are real⁶⁹ and that intervention indeed is created by UE indefinites as well, contra Szabolcsi and Zwarts (1993). Moreover, in the next section I will argue that indeed in this particular case, the explanation as to why quantifiers like *some* cause intervention also in questions about individuals can in fact be the same as to why degree questions show such an effect.

3 Predictions

In this section I discuss a number of interesting predictions that the present account makes for quantificational interveners. I will first look at the case of universal quantifiers in questions and point out an interesting connection that an interval semantics for degree expressions predicts to a scope puzzle that can be found in the domain of comparatives. Second, I discuss the case of upward entailing operators such as *some*, and show that the approach in this thesis in fact makes the correct predictions for them. Then I turn to the case of DE operators such as *noone*, and show why the present analysis predicts these to be acceptable, which is a good result, because these indeed seem to be acceptable in most contexts. Finally in the last part I discuss other DE quantifiers such as *few* vs. *only a few*

⁶⁸ As regards indefinites however the facts are not that clear: cf. discussion in Honcoop (1998) and in Chapter 5 of this thesis.

⁶⁹ Thanks to David Pesetsky for discussion on this issue.

and show that the account in this thesis seems however to predict the wrong outcome for *few*, but the correct one for *only a few*.

3.1. Every

As discussed above, de Swart (1992), Kiss (1993), Szabolcsi and Zwarts (1993) point out that questions such as (31) do not seem to have the reading in (31)b below, namely the reading where the universal quantifier takes narrow scope. The readings the question seems to have are the pair list reading in (31)a, and what these authors call “independent scope”, the reading that presupposes that everyone has the same height.

- (31) How tall is every boy?
- a. ‘For every boy x , how tall is every x ?’
 - b. ‘#For what d , every boy is at least d -tall?’
 - c. ‘What is the uniform degree of height such that everyone is exactly that tall?’

The missing reading is clearly predicted by the approaches that specify an ‘at least’ reading for numerals in degree expressions. On the other hand, an account that would take the exact readings to be basic would of course not predict this reading. Let’s look at the interval-based account. At first sight, it could seem that the interval account might make exactly the right prediction:

- (32) $\llbracket \text{How tall is every boy?} \rrbracket^w =$
= for what interval I . for every boy x , the height of $x \in I$

We are looking for the smallest interval that contains for every x , the height of x . If everyone is tall to the same degree d , then this interval will be the singleton set of degrees $\{d\}$. If however, various people have different heights, then we are looking for the smallest interval that contains these degrees. Let’s take for example the case that some people are 5 feet tall, others 5.5 and yet others 6. In this case the smallest such interval will be $[5,6]$ and the answer should be “between 5 and 6 feet”:

(33) -----[5---5.5---6]-----

I believe that this is also a possible reading (to the extent the pair-list reading is possible), though not always easy to get. It might seem then that the interval approach correctly predicts the non-existence of the reading in (31)b.

However, unfortunately, if we assume the existence of the Π -operator as it was argued in chapter 3 that we probably should, we lose the above account. This is because if now the Π -operator can scope above *everyone*, then in fact the existence of the missing reading is predicted, after all:

(34) for what I, I [$\Pi, \lambda d$ everyone is d -tall]
 $=\{ \max(\lambda d. \text{everyone is } d\text{-tall}) \in I \mid I \in D_I \}$
 the maximal degree such that everyone's height is at least that

At the same time, Benjamin Spector (pc.) points out that questions that contain universal modals like the one below seem to be able to get the 'at least' reading (note that this fact is rather problematic for an account such as Szabolcsi and Zwarts (1993), as they do not seem to have a means of predicting why a modal in this case might make a difference):

(35) How tall are you sure that every basketball player was?

This fact again might be explained by assuming that the Π -operator might take scope above the modal. If this is so, then an interesting generalization seems to emerge according to which the Π -operator can take wide scope above a modal to derive the 'at least' reading of (35) above, but not above a universal quantifier as in (31). While I have no explanation for this fact, the intriguing fact to observe is that Heim (2006) arrives at an identical restriction concerning the scope of the Π -operator in comparatives: it has to be able to take scope above a modal, but it cannot be allowed to take wide scope above a quantifier over individuals.⁷⁰

⁷⁰ But cf. Takahashi (2006) on questions about the validity of this generalization

- (36) John is taller than every girl is.
- a. Actual meaning: ‘for every girl x : John is taller than x ’
 - b. Missing reading : ‘John is taller than the degree d such that every girl is tall to that degree d . ’
- (37) John is faster than he needs to be.
- a. Actual reading: ‘John is faster than the degree d such that in every accessible world he is at least that fast’

Thus while the analysis based on intervals does not yet fully solve the problem at hand, it seems to offer an interesting connection to an already existing puzzle.

3.2. Some

As mentioned above, certain upward entailing existential quantifiers cause intervention as well, as it is the case with *some*: Indeed the examples below are rather odd (similar judgements are reported in Honcoop (1998))

- (38) ??How much did some men score?

In this section I observe that the reasoning based on maximal answers that has been argued for in this thesis explains this pattern: it predicts that the upward entailing quantifiers should cause intervention, even in questions about individuals.

Recall that I have been arguing in Chapter 3 that the semantics of degree questions should be captured by an interval based semantics of degree, advocated by Schwarzschild and Wilkinson (2002) and Heim (2006). Under this view, the Hamblin-denotation of the question above will look as follows:

- (39) For what interval I , $\exists X: \forall x \in X. x$'s score is in I ?

Given an upward entailing pattern, if an interval I covers interval K , the truth of *some girl's score* $\in K$ will entail the truth of *some girl's score* $\in I$. We are then looking for the smallest interval such that some girl's score is contained in it. Unfortunately, there will never be a unique minimal (smallest) such interval. This is because there will be many such intervals that contain some girl's scores, without any overlap.

Interestingly, this reasoning in fact extends to questions about individuals as well in this case: these too will be such that a unique maximal answer is not contained in the Hamblin set⁷¹:

- (40) ??Who did someone invite?
- a. For which individual Y , $\exists x$: x invited Y ?
 - b. $\{\exists x$: x invited a ;
 $\exists x$: x invited b ;
 $\exists x$: x invited $a+b$ }

Suppose we have only two individuals in our domain, a and b . Suppose further that someone indeed invited a and that someone indeed invited b . Now the truth of the propositions that someone invited a , and that someone invited b does not entail the truth of the proposition someone invited $a+b$. In this case, the most informative unique true answer then is not contained in the Hamblin denotation of the sentence, and therefore Dayal's presupposition is not met. Dayal's presupposition could only be met if we presupposed that invitations were made only by one person—in which case however the question is independently infelicitous.

3.3. DE quantifiers in questions

It has been argued by Rizzi (1990), besides negation DE quantifiers such as *few*, *less than 3* also seem to create weak island effects. Following Klima (1964) these are sometimes referred to as “affective” operators, more commonly though as (Strawson) DE operators. However, the generalization that affective operators create weak islands is too broad: *At*

⁷¹ Unless of course we presupposed that only one person invited anyone, or that everyone invited exactly the same individuals—however, in either case the use of *someone* is not felicitous for independent reasons.

most 3 e.g. is downward entailing, licenses NPIs, yet still it does not create weak islands, as noted by Szabolcsi and Zwarts (1993). In this section I look more closely at the effects of DE quantifiers in questions. I will observe that these are not uniform: *no one*, *at most 3* and *only a few* seem to be acceptable for most speakers I consulted. However, *few* and *less than 3* are not acceptable. I will show that the present approach predicts questions with DE quantifiers to be acceptable in fact—a prediction which seems correct for *no one*, *at most* and *only a few*, but not for *few* or *less than 3*. I will offer certain speculation as for why this pattern might arise, albeit the discussion will remain rather preliminary at this point.

3.3.1. No one

In Chapter 3 I have shown that in the case of negative islands there was no context in which there was a maximally informative answer. At the same time, certain modals were able to obviate the negative island effect—this was the pattern noted in Fox and Hackl (2005). More precisely, what we have seen was that in the cases where modals were able to rescue the negative island violations, there was *at least one* world in which there was a most informative answer. For example, in the case of a question such as (41) below, there was a situation, in which this question could receive a complete answer. Suppose we had a scenario such as the one illustrated in (42): this is a situation where one is allowed to have 1,2,3,or 4 children, but not more. In this case the interval $[5,\infty)$ was the unique maximal interval, such that it did not contain any degree that would have corresponded to the number of children that you were allowed to have. (Recall that I was assuming that the scale of degrees could be either discreet or dense, as required by our world knowledge. This parameter did not make any difference for our reasoning. In this case, I assume the scale is discreet.)

(41) How many children are you not allowed to have?

(42) $\mathbf{d}_{w1} \mathbf{d}_{w2} \mathbf{d}_{w3} \mathbf{d}_{w4}$ [-----{--<-----}-]-----

But it is possible to imagine scenarios in which the question in (41) would not have a maximal answer in the interval-based system I was proposing. For example imagine that in the far away kingdom of Antiprimia, what is not allowed is having a prime number of children. Clearly in this case there will be no unique interval covering all and only the degrees that correspond to the number of children that one is not allowed to have. Still, I was arguing, the question is grammatical: Our reasoning based on Gajewski (2002) only predicted that a question will be ungrammatical if there is *no* context in which it can have a most informative answer. The question in (41) can have such a context, e.g. the one illustrated in (42), therefore it is grammatical.⁷² In contrast, in the case of a simple negative question such as **How many children don't you have?* there was no scenario in which it could have a maximal answer.

Similarly to modals, quantifiers such as *no one, never, yet* also rescue negative degree questions if it is possible to find scenarios in which it is possible to find a maximal interval. Let's take a question such as (43) below:

- (43) [[How many books did none of the students read?]]
 $= \lambda p. \exists I [I \in D_I \ \& \ p = \lambda w'. \neg \exists x [\text{student}(x) \wedge \text{the number of books } x \text{ read} \in I \text{ in } w']]$

Imagine a situation in which there are four students, and they read 1,2,3 and 4 books respectively. In this case indeed there can be a maximal interval that contains all the intervals that do not contain any degrees such that a student read that many books: the interval $[5, \infty)$ i.e. *at least 5*. The picture below should serve as an illustration:

- (44) $\mathbf{d_{s1} \ d_{s2} \ d_{s3} \ d_{s4} \ [-----\{--\langle-----\rangle--\}----]-----}$

Another scenario in which the question might have a most informative answer is a scenario in which various students have read all numbers of books, except it so happens that no one read 5: in this case the only interval for which it is not true that someone read

⁷² How do I predict that it seems to be possible to answer: “Any prime number.”? We might follow Fox and Hackl (2005) at this point, who propose that Dayal (1996)’s condition might have to be weakened to state that it is *possible* that the conjunction of all true propositions in Q is itself a member of Q.

a number of books that is contained in this interval is the interval which corresponds to the singleton set $\{d_5\}$, *exactly 5*.

(45) $d_{s1} d_{s2} d_{s3} d_{s4} [d_5] d_{s6} d_{s7} d_{s8} d_{s9} \dots$

Let's look now at the case of manner questions such as the examples below:

(46) How has John never behaved at a party?

- (47) a. How hasn't anyone solved the exercise?
 b. ?How has no one solved the exercise?

An interesting aspect of these examples is that they are not only much better than the core cases of negative island violations with manners, but also we can observe that an answer to them seems to have a rather specific meaning. In particular, an answer to (47) '*by subtraction*' is acceptable if in a given contest, there are a number of ways of solving the exercise that we know about, and for all the other salient methods other than subtraction, at least one person solved the exercise in that way. Where does this requirement come from?

First observe what the explanation of these examples might be: I would like to propose that similarly to the case of modals above, what happens in these examples is that the mutually exclusive propositions get distributed over different times (in the case of *yet*, *never*) or they talk about different individuals (as in the case of *noone*). Lets look fort at the case of (46).⁷³ [Again, the existential quantification over events is presumably supplied by the temporal quantifier *never*]

(48) [[How has John never behaved at a party?]]

$$= \lambda p. \exists q_{\text{manner}} [q_{\text{manner}} \in D_M \ \& \ p = \lambda w'. \neg \exists t \leq t_{\text{now}} \exists e [\text{behave}(t)(e)(J)(w') \ \wedge \ q_{\text{manner}}(t)(e)(w')]$$

⁷³ I simplify the representation here by not representing the exact tense semantics of these examples.

A complete answer such as ‘Politely’ will state that politely is the most informative true answer, and as such it will imply that for all other alternative manners in the question denotation there was a time and event such that John behaved in that manner at that time. This then derives at the same time that the question should be non-contradictory and that it should have its implication. The reason why we avoid contradiction in this case is that now the offending contraries can hold at different times and events. The way we derive the implication is by the regular reasoning about the complete answer.

Similarly, in the case of an existential quantifier over individuals the different mutually exclusive manners are distributed over different individuals: this explains on the one hand why the contradiction is resolved, and on the other hand why we interpret a complete answer as implicating that for all the alternative manners of solving the exercise, someone solved it that way⁷⁴.

(49) How hasn’t anyone solved the exercise?

3.3.2. *Few, at most and only a few*

It has been argued in the literature that the operators *few/ less than 3* (but *not at most 3*) induce weak island effects:

- (50) a. ?*How many points did few girls score?
 b. ??How far did few girls jump?
 c. *How did less than 3 girls behave at the party?

(51) How did at most 3 girls behave?

Interestingly enough, in Hungarian and in Italian⁷⁵, adding an *only* in front of *few* has an effect of improving greatly the above violations⁷⁶:

⁷⁴ It seems that the judgements about the examples with *no one* are not completely uniform, and some people find them less than perfect. In fact in the literature sometimes such examples are represented with a star. I do not have any explanation for this variation at the moment.

⁷⁵ Italian judgements courtesy of Giorgio Magri (pc)

⁷⁶ in English, I am told, “only few” sounds odd, but sentences with “only a few” seem acceptable.(pc. Jon Gajewski)

entailing pattern the reasoning based on maximal answers does not in fact predict ungrammaticality. Observe the case of the question below:

(55) How much less than 3 girls score?

For what $I, \neg \exists X: |X| \geq 3 \ \& \ \forall x \in X \ x$'s score is in I ?

In this case we can have a maximal answer: this is because it is not true that any interval that contains a score that someone scored will make for a true alternative. E.g. if the degrees 1,2,3 and 4 are the only degrees such that 3 or more people scored that much, the interval $[5, \infty)$ will emerge as the maximal interval such that not more than 2 people have scored that much. Of course it is easy to imagine many other configurations that make it possible for the question to have meaningful maximal answer⁷⁷. Interestingly, the wrong prediction for *less than 3* above is in fact the right prediction for *at most 3*: [Szabolcsi, 1993 #4] reports manner questions to be acceptable with *at most* (cf. (51)) and similar pattern can be observed with degree questions.

(56) How much did at most 3 girls score?

It seems then that *at most 3*, *only less than 3* but not *less than 3* behaves then according to the predictions of the present accounts. Why should this be?

In the remainder of this section I offer some highly preliminary speculations as to where a difference between *few* and *only a few* might be stemming from, still. The reasoning is as follows. First, one might point out that quantifiers such as *few* in Hungarian obligatorily have to move to the preverbal focus position. (This is following Kiss (2007) e.g., and unlike Szabolcsi (1995)⁷⁸).

⁷⁷ One might object at this point that this analysis should predict that even a sentence such as the one below should sound odd, this is because we should predict that every actress was insulted by some paparazzi:

(1) Which actress did few paparazzi insult?

One difference is that while actresses may or may not be insulted by paparazzi, all girls would have to score something in $[0, \infty)$, or behave somehow.

⁷⁸ The disagreement is not about the facts, but whether the PredOp position postulated by Szabolcsi (1995) which walks and talks like the Focus position, is in fact to be equated with the Focus position. Also, the

- (57) a. *Mari evett kevés almát
 Mari ate few apple
 ‘Mari ate few apples’
- b. Mari evett egy kevés almát
 Mari ate a few apple
 ‘Mari ate a few apples’
- c. Mari [_{FP}kevés almát] evett
 Mari few apple ate
 ‘Mari ate few apples’

This fact I would take to indicate that the resulting DE meaning in Hungarian as a combination of an exhaustive operator (the focus) and an upward entailing quantifier akin to *a few*. In questions however the focus position is occupied by the question word, therefore *few* remains in a postverbal position, where it does not associate with focus easily at all, and tends to retain its UE meaning, unless it can combine with overt *only*. However, the UE meaning leads to a maximalization failure as we saw above. On the other hand, when we turn *few* into *only a few*, we can ask a meaningful question.

Suppose that in fact the Hungarian pattern might be generalized to other languages⁷⁹. Then we might reason as follows. Let’s first look at a degree question such as (58) below:

- (58) *How much did less than 3 girls score?

Recall that I have been arguing in Chapter 3 that the semantics of degree questions should be captured by an interval based semantics of degree, advocated by Schwarzschild and Wilkinson (2002) and Heim (2006). Under this view, the Hamblin-denotation of (58) above will look as follows:

focus position can only host one item, therefore, if there are more foci, (or more DE operators) all but one of them will have to be postverbal.

⁷⁹ How does *a few* behave in English? According to this reasoning it should cause intervention...

(59) For what interval I , $\exists X: |X| < 3$ & $\forall x \in X$ x 's score is in I ?

Given an upward entailing pattern, if an interval I covers interval K , the truth of *(a) few girl's score $\in K$* will entail the truth of *(a) few girl's score $\in I$* . We are then looking for the smallest interval such that a few girl's (or less than 3 girls's) score is contained in it. Unfortunately, there will not be a unique minimal interval like that.

However, if we add *only*, the picture changes:

(60) Hány pontot ért el csak kevesebb mint 3 lány?

How many scores reached *prt only less than 3 girl*?

For what I , $\neg \exists X: |X| \geq 3$ & $\forall x \in X$ x 's score is in I ?

This now can have a maximal answer: this is because it is not true any more that any interval that contains a score that someone scored will make for a true alternative. E.g. if the degrees 1,2,3 and 4 are the only degrees such that 3 or more people scored that much, the interval $[5, \infty)$ will emerge as the maximal interval such that not more than 2 people have scored that much. Of course it is easy to imagine many other configurations that make it possible for the question to have meaningful maximal answer⁸⁰.

(61) $d_1 d_2 d_3 d_4 [\text{-----} \{ \text{--} \langle \text{-----} \rangle \text{--} \} \text{---}] \text{-----}$

4. Conclusion

In this chapter I have made a number of empirical observations about the weak-island inducing effects of quantifiers in questions. In connection with universal quantifiers, I have noted a parallel that arises with the effects of quantifiers with comparatives. Then I

⁸⁰ One might object at this point that this analysis should predict that even a sentence such as the one below should sound odd, this is because we should predict that every actress was insulted by some paparazzi:

(2) Which actress did few paparazzi insult?

One difference is that while actresses may or may not be insulted by paparazzi, all girls would have to score something in $[0, \infty)$, or behave somehow.

have observed upward entailing existential quantifiers such as *some*, and noted that these in fact cause intervention effects, contrary to Szabolcsi and Zwarts (1993) Finally, I have noted that although the present approach makes the correct predictions for quantifiers such as *at most* or *only a few*, it struggles with quantifiers such as *few* and *less than 3*. I have offered some extremely preliminary speculations as to why this pattern arises. Clearly, the last word on quantificational intervention has not been said yet.

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