

## Negative Islands and Maximality

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### 1. Introduction

Negative islands have been the topic of quite a lot of debate in the recent literature (see Ross (1984), Rizzi (1990), Cinque (1990), Szabolcsi and Zwarts (1991; 1993), among others). The phenomenon is illustrated in (1) and (2):

- (1) a. I wonder how tall Marcus is.  
b. \* I wonder how tall Marcus isn't.
- (2) a. I wonder how tall every basketball player is.  
b. \* I wonder how tall no basketball player is.

The (b) sentences show that sentence negation (*n't*) and 'negative' quantifiers such as *no basketball player* may block *wh*-movement, whereas the affirmative sentences in (1a) and (2a) are unproblematic.

Not all *wh*-phrases are sensitive to negative islands. The extraction of *who* in (3) and (4), for instance, is not blocked:

- (3) a. I wonder who Marcus can beat.  
b. I wonder who Marcus can't beat.
- (4) a. I wonder who every basketball player can beat.  
b. I wonder who no basketball player can beat.

For this reason, Postal (1992) calls negative islands 'selective islands'. (In the literature the less appropriate term 'weak islands' is also used.)

The negative island effect is not just caused by *not* and NP's of the form *no N*, but by any element that is downward entailing in the sense of Ladusaw (1979). This is illustrated in (5):

- (5) a. \* I wonder how tall *no player* is.  
b. \* I wonder how tall *fewer than ten players* are.  
c. \* I wonder how tall *at most ten players* are.  
d. \* I wonder how tall *few players* are.

Though this is not often discussed explicitly in the literature (although it is probably assumed tacitly), the negative island effect is by no means limited to *wh*-questions. It can be observed in other *wh*-constructions as well:

#### *Comparatives*

- (6) a. These players weigh more than Lou does(\*n't).  
b. Lou runs faster than Marcus can(\*not) swim.

*Free relative clauses*

- (7) a. I don't weigh what these players (\*don't) weigh.  
b. Lou can run however fast Marcus can(\*not) run.

*Pseudo-clefts*

- (8) What these players (\*don't) weigh is at least 300 pounds.

In this paper I present a relatively simple and straightforward explanation of the negative island effect. This explanation is different from the accounts found in the literature, although it also draws on them, in particular Szabolcsi and Zwarts (1993). My account is similar to theirs in that it takes the negative island effect to be semantic in nature and in emphasizing the role played by algebraic structure. For reasons of space, I will not make explicit comparisons between my account and that of Szabolcsi and Zwarts, however.

The main claims I will make in this paper can be summarized as follows:

- The negative island effect results from a maximality requirement built into the semantics of certain *wh*-constructions.
- Maximality is a more general semantic property of *wh*-constructions which also accounts for the 'exhaustiveness' of questions and free relatives.
- The way maximality manifests itself depends on the algebraic structure of the domain of quantification.

## 2. Maximality in Comparatives

In presenting my explanation of the negative island effect in terms of maximality, I will start with an analysis of the semantics of comparatives. Von Stechow (1984) has argued that comparative clauses denote maximal degrees. First consider a simple comparative like (9):

- (9) Marcus is taller than Lou is.  
(10) Marcus is taller than [<sub>CP</sub> *Op*<sub>i</sub> [<sub>IP</sub> Lou is *d*<sub>i</sub>-tall]].  
(11) Marcus is taller than  $\iota d$ [Lou is *d*-tall].  
(12) Marcus is taller than six feet.

I will assume that at the syntactic level that is the input to semantic interpretation, the structure of this sentence is something along the lines of (10), where *Op*<sub>i</sub> represents an empty *wh*-operator in the specifier of CP and *d*<sub>i</sub> is an empty category corresponding to a degree variable. (My analysis is also compatible with different syntactic assumptions, however.) The most straightforward semantic analysis of (9) would be the one given in (11), where *Op*<sub>i</sub> is translated as a iota-operator which binds the degree variable. Under this analysis the sentence means that Marcus is taller than the unique degree *d* such that Lou is *d*-tall.<sup>1</sup> Thus the comparative clause (*i.e.* the complement of *than*) denotes a unique degree of tallness just like the measure phrase *six feet* does in (12).

However, as von Stechow has shown, using the iota-operator to bind the degree variable leads to difficulty in cases where there is no unique degree. This is the case whenever the comparative clause contains an element that functions as an existential quantifier, such as an indefinite NP or a modal like *can*. (13) is an example:

- (13) Marcus was running faster than a shark can swim.
- (14) Marcus was running faster than  $\iota d$ [a shark can swim  $d$ -fast].
- (15) Marcus was running faster than  $\max(\lambda d$ [a shark can swim  $d$ -fast]).

Since there is no unique degree  $d$  such that a shark can swim  $d$ -fast, (14) will not do as a semantic representation of (13). What (13) really means is that Marcus was running faster than the *maximal* degree  $d$  such that a shark can swim  $d$ -fast. To get this interpretation we need an operator that picks out the maximal degree from a set of degrees, as in (15). The semantics of this maximality operator  $\max$  is defined in (16):

- (16) Let  $D$  be a set of degrees ordered by the relation  $\leq$ , then  
 $\max(D) =_{\text{def}} \iota d [d \in D \wedge \forall d' \in D [d' \leq d]]$ .

Von Stechow shows that his proposal that comparative clauses denote maximal degrees explains why they exhibit the negative island effect (although he didn't use that term, of course). Consider (17) and (18):

- (17) a. Derek weighs more than Mike weighs.  
 b. Derek weighs more than  $\max(\lambda d$ [Mike weighs  $d$ -much]).
- (18) a. \* Derek weighs more than Mike doesn't weigh.  
 b. \* Derek weighs more than  $\max(\lambda d$ [Mike doesn't weigh  $d$ -much]).

(17a) is unproblematic; it simply means that Derek weighs more than the maximal degree  $d$  such that Mike weighs  $d$ -much, as represented in (17b). If we add a negation to the comparative clause, as in (18a), however, the sentence becomes unacceptable. It is not hard to see why if we consider the semantics of this sentence. (18a) should mean that Derek weighs more than the maximal degree  $d$  such that Mike doesn't weigh  $d$ -much. But there simply is no such maximal degree  $d$ . Suppose Mike weighs 150 pounds. Then he doesn't weigh 151 pounds, or 152 pounds, or 160 pounds, or 200 pounds, or 2 million pounds. The set of weights  $d$  such that Mike does not weigh  $d$  has no maximal member. Hence, (18a) cannot be interpreted, which is why it is unacceptable. Note that this explanation is not limited to negative island effects caused by simple negation, but extends to all downward entailing contexts.

So far I have left the semantics of comparatives rather unexplicit, focusing only on maximality. Before I go on to discuss maximality and the negative island effect in other *wh*-constructions I would like to present in a little more detail what I take the semantics of comparatives to be, again largely following von Stechow. I assume that degree predicates such as *tall* denote relations between individuals and degrees. Thus, (19a) is translated as (19b). The measure phrase *six feet* denotes a specific degree here indicated as 6ft. The comparative (20a) can then be translated as (20b), meaning that there is a degree  $d$  which is greater than six feet such that Marcus stands in the tall-relation to  $d$ . When the complement of *than* is a clause rather than a measure phrase, as in (21a), we can treat the comparative clause as a degree-denoting expression analogous to a measure phrase like *six feet* by means of the *max*-operator (see (21b)):

- (19) a. Marcus is six feet tall.  
 b. tall(m,6ft)

- (20) a. Marcus is taller than six feet.  
 b.  $\exists d[d > 6\text{ft} \wedge \text{tall}(m,d)]$
- (21) a. Marcus is taller than Lou is.  
 b.  $\exists d[d > \max(\lambda d'[\text{tall}(l,d')]) \wedge \text{tall}(m,d)]$

One of the nice consequences of the maximality account of the semantics of comparatives is that it explains some important logical properties of the comparative, as was shown by von Stechow (1984). Without going into details (for more discussion, see Rullmann (1994b)), the semantics just sketched accounts for the fact that comparatives are downward entailing, a property which is formally defined in (22). The downward entailing character of comparatives is reflected in the intuitive validity of the entailment given in (23), as well as in the fact that comparatives can license negative polarity items such as *any* (see (24)). As Ladusaw (1979) has argued, negative polarity items need to occur in the scope of a downward entailing expression in order to be licensed.

- (22) A function  $f$  is *downward entailing* iff for all  $X, Y$  in the domain of  $f$ :  
 if  $X \subseteq Y$ , then  $f(Y) \subseteq f(X)$  (Ladusaw (1979))
- (23) Seymour is richer than a student can be  $\Rightarrow$   
 Seymour is richer than a foreign student can be
- (24) Seymour is richer than *any* student can be.

Maximality guarantees that comparatives have an even stronger property, namely that of being anti-additive in the sense of Zwarts (1986) and Hoeksema (1983). Intuitively, this comes down to the fact that a disjunction inside the comparative clause is equivalent to a wide scope conjunction (see (26)):

- (25) A function  $f$  is *anti-additive* iff for all  $X, Y$  in the domain of  $f$ :  
 $f(X \cup Y) = f(X) \cap f(Y)$  (Zwarts (1986), Hoeksema (1983))
- (26) Carla is smarter than Sandra or Becky is  $\Leftrightarrow$   
 Carla is smarter than Sandra is and Carla is smarter than Becky is

The argument for the role of maximality in the semantics of comparatives is therefore supported by the overall logical behavior of the construction. In the following sections, we will see that there is reason to assume that maximality plays a role in other *wh*-constructions as well.

### 3. Maximality in Degree Questions

Von Stechow's argument for maximality in comparatives carries over straightforwardly to *wh*-questions involving degrees. Degree questions like (27a) and (28a) can be paraphrased as (27b) and (28b), respectively:

- (27) a. How tall (do you think) Marcus is?  
 b. What is the maximal degree  $d$  such that Marcus is  $d$ -tall?  
 c.  $?d[d = \max(\lambda d'[\text{Marcus is } d'\text{-tall}])]$
- (28) a. How fast (do you think) Marcus can run?  
 b. What is the maximal degree  $d$  such that Marcus can run  $d$ -fast?  
 c.  $?d[d = \max(\lambda d'[\text{Marcus can run } d'\text{-fast}])]$

The maximality operator is needed for cases like (28a), because of the presence of the modal *can*. Somebody who asks (28a) only wants to know what Marcus's maximal running speed is. Say Marcus can run at most five miles per hour. Then he can also run four miles per hour, or three, or two. However, in that scenario *four miles per hour* would not be a true answer to (28a). In (27c) and (28c) I have given a quasi-formal representation of the paraphrases in (b), using the operator  $\text{?}$  to bind the degree variable. The interpretation of *wh*-questions will be spelled out more explicitly in section 5.

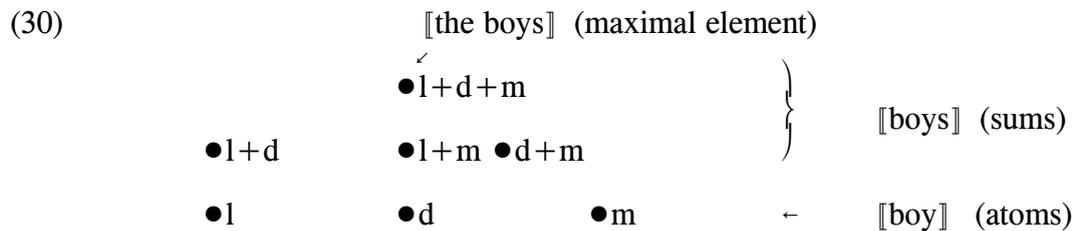
Given that degree questions involve reference to maximal degrees, we can understand why the negative island effect is found here as well. Take for instance (29a). As paraphrased in (29b), and captured slightly more formally in (29c), this question asks for the maximal degree  $d$  such that Marcus is not  $d$ -tall. Since there is no such maximal degree, the sentence is ungrammatical:

- (29) a. \* How tall (do you think) Marcus isn't?  
 b. \* What is the maximal degree  $d$  such that Marcus isn't  $d$ -tall?  
 c. \*  $\text{?}d[d = \max(\lambda d'[\text{Marcus isn't } d'\text{-tall}])]$

So far we have seen arguments for maximality in two sorts of *wh*-constructions that involve degrees, namely comparatives and degree questions. In the rest of the paper I will argue that maximality is a more general phenomenon that is also found in *wh*-constructions that do not involve degrees but individuals. In such cases maximality takes the form of exhaustiveness. I will discuss free relatives and non-degree *wh*-questions.

#### 4. Maximality in Free Relatives

Jacobson (1990) argues that free relatives denote maximal individuals. She assumes a Link-style semantics for noun phrases in which the domain of individuals  $D$  contains not just atomic individuals but also sums of individuals. Suppose there are three boys in  $D$ , say Lou, Derek, and Marcus. Besides those three atomic individuals,  $D$  then also contains the sums of those individuals, as illustrated in (30). In algebraic terms, the set of boys and their sums forms a complete atomic join semi-lattice ordered by the part-of relation, whose atomic elements are the individual boys and whose top element is the sum of all three boys.



The denotation of the singular noun *boy* is the set whose members are the three individual boys. This set is a subset of  $AT$ , the set of atomic individuals. The plural noun *boys* denotes the non-atomic individuals whose atomic parts are elements of the set denoted by *boy*. This is stated more succinctly in (31):

- (31) a.  $[[\text{boy}]] \subseteq \text{AT}$   
 b.  $[[\text{boys}]] = \{x \in (\text{D-AT}) \mid \exists X \subseteq [[\text{boy}]] \text{ such that } x = +X\}$

One of the advantages of this approach is that it allows us to give a unified account of the interpretation of the definite determiner in both singular and plural noun phrases.<sup>2</sup> The denotation of a noun phrase of the form *the N* will be the maximal element in the set denoted by the noun *N*. Here maximality is defined with respect to the part-of relation ( $\leq$ ) among elements of *D*:

- (32) a.  $[[\text{the } N]] = \text{max}([N])$   
 b.  $\text{max}(A) = \iota x[x \in A \wedge \forall x' \in A[x' \leq x]]$

For a plural noun phrase like *the boys*, this means that its denotation ( $[[\text{the boys}]]$ ) is the maximal individual in the set  $[[\text{boys}]]$ , that is, the sum of all the boys in *D* (compare (30)). The denotation of the singular noun phrase *the boy* will be the maximal individual in the set  $[[\text{boy}]]$ . Because  $[[\text{boy}]]$  consists of atomic individuals, it will only contain a maximal individual if it is a singleton set. Therefore  $[[\text{the boy}]]$  is only defined if there is exactly one boy. By translating the definite determiner as the maximality operator we can therefore capture both the universal force of plural definite NP's and the uniqueness requirement of singular definite NP's.

Jacobson (1990) extends Link's semantics for the definite determiner in an interesting way to free relatives. She notes that free relatives can sometimes be paraphrased as singular definites (as in (33)) and sometimes as universal quantifiers (for example (34)):

- (33) a. I ordered what he ordered for desert.  
 b. I ordered the thing he ordered for desert.  
 (34) a. John will read whatever Bill assigns.  
 b. John will read everything/anything Bill assigns.

Jacobson provides evidence that, despite the plausibility of a paraphrase like (34b), free relatives in fact should not be analyzed as universal quantifiers. Free relatives differ from universal quantifiers in that they support cross-sentential anaphora (see (35)), cannot be modified by *almost* (see (36)), and do not license negative polarity items (as in (37)):

- (35) a. John read whatever Bill assigned - although I don't remember what it was, but I do know that it was long and boring.  
 b. \* John read everything/anything that Bill assigned, although I don't remember what it was, but I do know that it was long and boring.  
 (36) a. \* For years, I did almost whatever you told me to do.  
 b. For years I did almost everything/anything you told me to do.  
 (37) a. \* I can read whatever Bill ever read.  
 b. I can read everything/anything that Bill ever read.

Jacobson argues that free relatives uniformly denote maximal individuals and therefore are more like definite NP's. Evidence for this comes from the 'exhaustive listing' effect found in pseudo-clefts like (38a). (Following Higgins (1973) we may assume that the *wh*-clause in a pseudo-cleft sentence is a free relative.) (38a) differs from (38b) in that it entails that beans, rice and tacos are the *only* things that John ordered:

- (38) a. What John ordered are beans, rice, and tacos.  
 b. John ordered beans, rice, and tacos.

The exhaustive listing effect is accounted for if the free relative (39a) is translated as the maximal individual that John ordered, that is, the sum of everything John ordered (see (39b)):

- (39) a. what John ordered  
 b.  $\max(\lambda x[\text{ordered}(j,x)])$

(38a) as a whole then means that the maximal individual that John ordered is the sum of beans, rice and tacos (here I ignore certain typeshifts that play a role in deriving this interpretation; see Jacobson (1990)):

$$(40) \quad \max(\lambda x[\text{ordered}(j,x)]) = b+r+t$$

Unlike ordinary definite NP's, free relatives are not marked for number. This explains why maximality in free relatives sometimes manifests itself as uniqueness and sometimes as universality, depending on contextual factors. In the former case the free relative can be paraphrased as a singular definite NP as in (33), while in the latter case it may seem more appropriate to translate it as a universally quantified or plural definite NP (see (34)).

Given the role of maximality in free relatives, we can explain the negative island effect in examples (7) and (8), which are repeated here for convenience:

- (7) a. I don't weigh what these players (\*don't) weigh.  
 b. Lou can run however fast Marcus can(\*not) run.  
 (8) What these players (\*don't) weigh is at least 300 pounds.

The denotation of the free relative *what these players weigh* is  $\max(\lambda d[\text{weigh}(\text{players},d)])$ , that is, the maximal degree  $d$  such that these players weigh  $d$ -much. However, *what these players don't weigh* should denote  $\max(\lambda d[\neg \text{weigh}(\text{players},d)])$ , the maximal degree  $d$  such that these player's don't weigh  $d$ -much. Again, such a maximal degree does not exist.

## 5. Maximality and Exhaustiveness in Questions

I now turn to *wh*-questions that involve individuals instead of degrees. I will show (following a suggestion made by Jacobson (1990)) that maximality can account for a property of questions that was argued for on independent grounds by Groenendijk and Stokhof (1982), namely strong exhaustiveness.

My starting point is the theory of questions proposed by Karttunen (1977). According to this theory a question denotes the set of propositions that are true answers to the question. So for instance, (41) denotes the set of propositions given in (42). Informally, this set can be characterized as the set of true propositions of the form 'John read  $x$ .'

- (41) What did John read?  
 (42)  $\lambda p \exists x[p(w) \wedge p = \lambda w'[\text{read}(w')(j,x)]]$

(In (42) I use an intensional language with explicit quantification over possible worlds. A formula like  $\text{read}(w)(j,x)$  should be read as 'John read  $x$  in world  $w$ .'  $p$  is a variable over propositions.  $p(w)$  means that  $p$  is true in world  $w$ . If the variable  $w$  is not bound in a formula, then the world that is assigned to it is assumed to be the actual world.)

Suppose that in the actual world John read three books, namely *Anna Karenina*, *Oblomov*, and *Crime and Punishment*. Then (42) denotes the set containing the following three proposition:

John read *Anna Karenina*.  
John read *Oblomov*.  
John read *Crime and Punishment*.

This set is given in (43):

$$(43) \quad \{\lambda w[\text{read}(w)(j,a)], \lambda w[\text{read}(w)(j,o)], \lambda w[\text{read}(w)(j,c)]\}$$

Now suppose we add maximality to the interpretation of questions. We can do this by replacing (42) as the denotation of (41) by (44):

$$(44) \quad \lambda p \exists x [p(w) \wedge p = \lambda w' [x = \max(\lambda y [\text{read}(w')(j,y)])]]$$

This is the set of true propositions of the form 'x is the maximal individual that John read.' Because there is at most one such maximal individual, the set denoted by (44) will contain at most one proposition. In the situation described above, (44) denotes the singleton set that has the following proposition as its only member:

The maximal individual that John read is the sum of *Anna Karenina*, *Oblomov*, and *Crime and Punishment*.

This proposition in effect says that John read *Anna Karenina*, *Oblomov*, and *Crime and Punishment*, and nothing else. The set that is the denotation of (44) is represented more formally in (45):

$$(45) \quad \{\lambda w [a+o+c = \max(\lambda y [\text{read}(w)(j,y)])]\}$$

By adding maximality to Karttunen's theory in this way, we get a theory in which questions denote singleton sets of propositions. Because there is a one-to-one correspondence between singleton sets and their members, we may as well say that questions denote propositions, rather than singleton sets of propositions. That is, we can take (46) as the denotation of (41):

$$(46) \quad \iota p \exists x [p(w) \wedge p = \lambda w' [x = \max(\lambda y [\text{read}(w')(j,y)])]]$$

In the scenario sketched above, (46) denotes the proposition given in (47):

$$(47) \quad \lambda w [a+o+c = \max(\lambda y [\text{read}(w)(j,y)])]$$

We have thus arrived at a theory in which the denotation of the question *what did John read?* is the unique proposition of the form 'The maximal individual that John read is  $x$ ,' where  $x$  is the sum of everything that John read in the actual world.

Having given this semantics for *wh*-questions involving individuals, we can extend it to degree questions. Earlier I gave (48b) as a quasi-formal representation for the meaning of (48a). This can now be spelled out as (48c), which is completely parallel to (46):

- (48) a. How tall (do you think) Marcus is?  
 b.  $?d[d = \max(\lambda d'[\text{Marcus is } d'\text{-tall}])]$   
 c.  $\iota p \exists d[p(w) \wedge p = \lambda w'[d = \max(\lambda d'[\text{tall}(w')(m, d')])]]$

A theory in which questions denote propositions is not unprecedented. In fact, a theory of this kind has been proposed by Groenendijk and Stokhof (1982). According to them (41) denotes the proposition given in (49):

$$(49) \quad \lambda w'[\lambda x[\text{read}(w)(j, x)] = \lambda x[\text{read}(w')(j, x)]]$$

This formula denotes the set of worlds  $w'$  such that the set of things that John read in  $w'$  is identical to the set of things that John read in  $w$  (the actual world). In the situation described above, (49) denotes the proposition which is true in a world  $w'$  iff the set of books that John read in  $w'$  consists of *Anna Karenina*, *Oblomov*, *Crime and Punishment*, and nothing else. Note that this is very similar to the proposition given in (47), which was arrived at by modifying Karttunen's theory of questions. In both cases the denotation of (41) in the situation described is in effect the proposition that John read *Anna Karenina*, *Oblomov*, and *Crime and Punishment*, and nothing else. By adding maximality to Karttunen's theory we have ended up with a theory that is very much like the theory of Groenendijk and Stokhof.

Groenendijk and Stokhof argue that their theory of questions is superior to that of Karttunen because it guarantees a strong form of exhaustiveness. They distinguish two types of exhaustiveness for questions. If *weak exhaustiveness* is satisfied then the following must be the case: if Mary knows what John read, then for any  $x$ , if John read  $x$ , then Mary knows that John read  $x$ . That is, weak exhaustiveness holds if inferences of the following kind are valid:

- (50) *Weak exhaustiveness:*  
 Mary knows what John read.  
 John read *Crime and Punishment*.  
 Therefore: Mary knows that John read *Crime and Punishment*.

*Strong exhaustiveness* on the other hand is satisfied if, in addition to weak exhaustiveness, the following holds: if Mary knows what John read, then for any  $x$ , if John did not read  $x$ , then Mary knows that John did not read  $x$ . Thus under strong exhaustiveness inferences of the following type will be valid:

- (51) *Strong exhaustiveness*  
 Mary knows what John read.  
 John did not read *Dead Souls*.  
 Therefore: Mary knows that John did not read *Dead Souls*.

Groenendijk and Stokhof give arguments for why we should want our theory of questions to satisfy not only weak, but also strong exhaustiveness. I will not repeat those arguments here for reasons of space. Karttunen's theory does guarantee weak exhaustiveness (albeit by means of a meaning postulate), but it does not guarantee strong exhaustiveness. Groenendijk and Stokhof's own theory guarantees both weak and strong exhaustiveness. The reason is the following. Suppose that John in fact read *Anna Karenina*, *Oblomov*, and *Crime and Punishment*, and nothing else. Then *Mary knows what John read* will be true iff

Mary stands in the know-relation to the proposition given in (49), which in this situation is the proposition that John read *Anna Karenina*, *Oblomov*, and *Crime and Punishment*, and nothing else. On the assumption that knowing a proposition implies knowing its entailments, this means that Mary also knows that John read *Crime and Punishment* (weak exhaustiveness) and that she knows that he did not read *Dead Souls* (strong exhaustiveness).<sup>3</sup>

In the theory of questions we arrived at by adding maximality to Karttunen's theory, weak and strong exhaustiveness are guaranteed for the same reasons as in Groenendijk and Stokhof's theory. In the situation described above *Mary knows what John read* is true iff Mary stands in the know-relation to the proposition given in (47), that is, the proposition that the maximal individual that John read is the sum of *Anna Karenina*, *Oblomov*, and *Crime and Punishment*. Again this implies that Mary also knows that John read *Crime and Punishment* and that he did not read *Dead Souls*.

What we see then is that maximality plays a role not just in degree questions, where it accounts for the fact that degree questions always ask for the 'highest' degree, but also in questions involving individuals, where it gives rise to (strong) exhaustiveness.

## 6. Conclusion

In this paper I have discussed the different ways in which maximality can manifest itself, depending on the algebraic structure of the domain of quantification. In the domain of degrees, which are ordered linearly, the maximality operator picks out the 'highest' element from a set of degrees. In a set of Linkian individuals which form a complete join semi-lattice, the maximal element is the sum of all the elements of the set. In domains of this type maximality gives rise to exhaustiveness or (apparent) universal quantificational force. In a set of unordered elements (such as the denotation of the singular count-noun *boy*) maximality results in uniqueness.

To conclude this paper I return once more to the negative island effect. In the introduction I observed that negative islands are selective in the sense that they block certain *wh*-phrases (in particular, degree phrases) but not others, such as *who* (cf. (3) and (4)). We can now understand this difference as resulting from the different algebraic structure of the domain of degrees versus the domain of individuals. The denotation of the *wh*-complement *who Marcus can't beat* in (3b), for instance, will be the following proposition:

$$(52) \quad \iota p \exists x [p(w) \wedge p = \lambda w' [x = \max(\lambda y [\neg \text{can-beat}(w')(m,y)])]]$$

The denotation of  $\max(\lambda y [\neg \text{can-beat}(w')(m,y)])$  is the sum of all the individuals that Marcus can't beat in  $w'$ . This sum will always be defined, at least if the domain of individuals is finite.

Finally I should say something about the negative island effect in *wh*-questions with adjuncts such as *how* and *why*, which has been the focus of much of the discussion of negative island effects in the literature. (53) is an example:

- (53) a. I wonder how Marcus behaved.  
 b. \* I wonder how Marcus didn't behave.

I believe the ungrammaticality of cases like (53b) is of a pragmatic nature. Going

back to (52), note that in order to form the sum of all the individuals Marcus can't beat we have to take the complement of the set consisting of all people Marcus can beat (cf. Szabolcsi and Zwarts (1993) for discussion of this point). Taking this complement only makes sense against the background of a contextually determined set of individuals, which in this case could for instance consist of Marcus's potential opponents. In the context of a chess tournament we would not want to include Boris Yeltsin or Aristotle in the sum of all the individuals Marcus can't beat, simply because they are irrelevant. Using negation in a *wh*-question (or other *wh*-construction) therefore only makes sense pragmatically if the *wh*-phrase ranges over a restricted set that is determined by the context. In the terminology of Pesetsky (1987) and Cinque (1990), the *wh*-phrase must be discourse-linked (d-linked). The ungrammaticality of (53b) and other cases of `adjunct'-extraction<sup>4</sup> out of a negative island is due to the failure of *wh*-phrases like *how* and *why* to be d-linked. For more discussion of this point the reader is referred to chapter 5 of Rullmann (1994a).

## Footnotes

\*. This paper discusses some of the issues treated at greater length in my doctoral dissertation *Maximality in the Semantics of Wh-Constructions* (University of Massachusetts at Amherst). I am indebted to the members of my dissertation committee for discussion of these issues, in particular Barbara Partee and Angelika Kratzer.

1. For the sake of argument I assume here that *Marcus is six feet tall* is true iff Marcus is *exactly* six feet tall, and not if he is, say, six feet and two inches. If we made the assumption that *Marcus is six feet tall* is true iff Marcus is *at least* six feet tall, then there would be no unique degree such that Marcus is *d*-tall, and therefore we would need the maximality operator that is to be introduced below even to handle this case.

2. I only discuss count nouns here. Link's semantics for the definite determiner also extends to mass NP's (see Link (1983)).

3. Groenendijk and Stokhof argue that exhaustiveness is only guaranteed for predicates like *know* (which they call extensional), but not for those like *guess* and *wonder* (which according to them are intensional). See Groenendijk and Stokhof (1982) for discussion.

4. In Rizzi (1990) and Cinque (1990) and subsequent literature, it is shown that the distinction between phrases that are sensitive to negative islands and those that are not is actually not the syntactic difference between adjuncts and arguments, but that this distinction must be of a semantic/pragmatic nature.

## References

- Cinque, G. (1990). *Types of A'-Dependencies*. MIT Press, Cambridge.  
 Groenendijk, J. and M. Stokhof (1982). `Semantic analysis of wh-complements.' *Linguistics and Philosophy* 5: 175-233.  
 Higgins (1973). *The Pseudo-Cleft Construction in English*. Ph.D. Dissertation, MIT. Published by Garland, New York, 1979.

- Hoeksema, J. (1983). 'Negative Polarity and the Comparative.' *Natural Language and Linguistic Theory* 1: 403-434.
- Jacobson, P. (1990). 'On the Quantificational Force of English Free Relatives.' Manuscript, Brown University.
- Karttunen, L. (1977). 'Syntax and Semantics of Questions.' *Linguistics and Philosophy* 1: 3-44.
- Ladusaw, W.A. (1979). *Polarity Sensitivity As Inherent Scope Relations*. Ph.D. Dissertation, University of Texas at Austin.
- Link, G. (1983). 'The Logical Analysis of Plurals and Mass Terms.' In R. Bäuerle, C. Schwarze and A. von Stechow (eds.) *Meaning, Use and Interpretation of Language*. Walter de Gruyter, Berlin.
- Pesetsky, D. (1987). 'Wh-in-Situ: Movement and Unselective Binding.' In E.J. Reuland and A.G.B. ter Meulen (eds.) *The Representation of (In)definiteness*. MIT Press, Cambridge.
- Postal, P. (1992). 'Overlooked Extraction Distinctions.' Manuscript.
- Rizzi, L. (1990). *Relativized Minimality*. MIT Press, Cambridge.
- Ross, J.R. (1984). 'Inner Islands.' In C. Brugmann and M. Macauley (eds.) *Proceedings of Tenth Annual Meeting of the Berkeley Linguistic Society*.
- Rullmann, H. (1994a). *Maximality in the Semantics of Wh-Constructions*. Ph.D. Dissertation, University of Massachusetts at Amherst.
- Rullmann, H. (1994b). 'The Ambiguity of Comparatives with *Less*.' In J. Fuller, H. Han, and D. Parkinson (eds.) *Proceedings of ESCOL '94*. DMLL Publications, Cornell University.
- Stechow, A. von (1984). 'Comparing Semantic Theories of Comparison.' *Journal of Semantics* 3: 1-77.
- Szabolcsi, A. and F. Zwarts (1991). 'Unbounded dependencies and algebraic semantics.' Lecture Notes, Summer School, Saarbrücken, Germany.
- Szabolcsi, A. and F. Zwarts (1993). 'Weak Islands and an Algebraic Semantics for Scope Taking.' *Natural Language Semantics* 2: 1-50.
- Zwarts, F. (1986). *Categoriale Grammatica en Algebraïsche Semantiek*. Dissertation, Rijksuniversiteit Groningen, The Netherlands.

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