When negation gets in the way

1. Some phenomena

Degree questions

Negation creates an "island" for *wh*-phrases in degree interrogatives. (Examples form Rullmann 1995).

(1) a. I wonder how tall Marcus is __.
b. * I wonder how tall Marcus isn't __.

(2) a. I wonder how heavy this piece of equipment is __.
b. * I wonder how heavy this piece of equipment isn't __.

(3) a. I wonder how fast Lou can run __ .
b. * I wonder how fast Lou can't run __ .

Not all types of *wh*-phrases are subject to this restriction.

(4) a. I wonder which book Theodore read __ .
b. I wonder which book Theodore didn't read __ .

Multiple questions

Pesetsky (2000) observes that negation also destroys the acceptability of certain multiple *wh*-questions.

(5)a. Who __ read *what*?
b. * What did *who* read __ ?

(6)a. Which person __ read *which book*?
b. Which book did *which person* read __ ?

(7) a. Which person __ didn't read *which book*?
b. * Which book didn't *which person* read __ ?

How many questions

In *how many* interrogatives, adding negation usually does not destroy acceptability. But in some cases the negative sentence lacks a kind of ambiguity that is observed in its positive counterpart.

(8) How many books are we required to read __ ?

(9) a. ?n: |{x: x is a book such that it is necessary that we read x}| = n
b. ?n: it is necessary that |{x: x is a book such that we read x}| = n

If every student has to read the three books listed in the left column below as well as two books from the right column, then both “three” and “five” can be true answers to (8). Unexpectedly, (11) below only allows for a true answer “five”, not for “six”, “seven”, or “eight”.

(10)		
	1. *The Venetian Affair*	1. *Anna Karenina*
	2. *The Big Sleep*	2. *The Magic Mountain*
	3. *Journey into Fear*	3. *The Return of the King*
		4. *The Long Goodbye*
		5. *To the Hilt*

(11) How many books are we not required to read __ ?

(12)a. ?n: |{x: x is a book such that it is not necessary that we read x}| = n
b. * ?n: it is not necessary that |{x: x is a book such that we read x}| = n

Questioned clefts

The following pattern does not seem to have been discussed in the literature.

(13)a. What did you not read __ ?
b. What is it that you didn’t read __ ?
c. * What isn’t it that you read __ ?

German separation constructions

Beck (1996) discusses a family of constructions in which negation cannot intervene between two expressions that presumably have to be adjacent at logical form.

(14)	*Was*	glaubst	du	[mit wem	Hans	____	gesprochen	hat]?
	what	*think*	*you*	*with whom*	*Hans*		*talked*	*has*

‘Who do you think that Hans talked to?’

(15) *	*Was*	glaubst	du	nicht	[mit wem	Hans	____	gesprochen	hat] ?
	what	*think*	*you*	*not*	*with whom*	*Hans*		*talked*	*has*

Comparatives

Von Stechow (1985) notes contrasts like the following.

(16)a. John weighs more than Bill weighs __ .
b. * John weighs more than Bill doesn’t weigh __ .

2. Negative comparatives are unusable

Following von Stechow (1985), Rullmann (1995) proposes that *more than* comparatives are interpreted as sketched below.

(17) John weighs more than Bill weighs.

(18) **more [than$_2$ [Bill weighs t_2]] 1 [John weighs t_1]**

(19) [[**than$_2$ [Bill weighs t_2]**]] = {d: Bill weighs d-much}
[[**1 [John weighs t_1]**]] = {d: John weighs d-much}

(20) [[**more** α β]] = 1 iff $\exists$d[d$\in$[[β]] & d>max[[α]]]

(21) [[**more [than$_2$ [Bill weighs t_2]] 1 [John weighs t_1]**]] = 1 iff
$\exists$d[John weighs d-much & d>max{d: Bill weighs d-much}]

Why does Rullmann take *more* to pick out the maximal element of the set denoted by the *than*-clause?

(22) John weighs more than Bill can weigh.

(23) **more [than$_2$ [Bill can weigh t_2]] 1 [John weighs t_1]**

(24) [[**than$_2$ [Bill can weigh t_2]**]] = {d: Bill can weigh d-much}

(25) [[**more [than$_2$ [Bill weighs t_2]] 1 [John weighs t_1]**]] = 1 iff
$\exists$d[John weighs d-much & d>max{d: Bill can weigh d-much}]

The *than*-clause in (22) denotes the set of all weights that Bill can have, so (22) is correctly predicted to say that John's weight is greater than the maximal element of that set.

(26) * John weighs more than Bill doesn't weigh.

(27) **more [than$_2$ [Bill can weigh t_2]] 1 [John doesn't weigh t_1]**

(28) [[**than$_2$ [Bill doesn't weigh t_2]**]] = {d: Bill doesn't weigh d-much}

(29) [[**more [than$_2$ [Bill weighs t_2]] 1 [John weighs t_1]**]] = 1 iff
$\exists$d[John weighs d-much & d>max{d: Bill doesn't weigh d-much}]

Since {d: Bill doesn't weigh d-much} does not have a maximal element, the negative comparative sentence is not assigned any truth conditions. In Rullmann's account, the sentence is ruled out as unusable.

3. Are negative degree questions unusable, too?

(30)a. How long did it take?
b. * How long didn't it take?

Question denotations as sets

In a view going back to Karttunen (1977) and Hamblin (1973), a question denotes a set of propositions - the set of propositions that are possible answers to the question.

(31) Did Rajesh teach the class?
{that Rajesh taught the class, that Rajesh did not teach the class}

(32) Did Rajesh or Bernhard teach the class?
{that Rajesh taught the class, that Bernhard taught the class}

(33) Which instructor taught the class?
{that Rajesh taught the class, that Bernhard taught the class}

Karrtunen style composition of *wh*-questions

(34) [[**wh** α β]] = {[[β]](x): [[α]](x) is true}

This rule assumes an intensional semantics, that is, it assumes that declarative sentences denote propositions, rather than truth values. Accordingly, one-place predicates are taken to denote properties, that is, functions from the set of individuals into the set of propositions. In particular, we have [[**instructor**]] = [$\lambda y \in D$. that y is an instructor] and [[**1 [t_1 taught the class]**]] = [$\lambda y \in D$. that y taught the class].

(35) [[**which instructor 1 [t_1 taught the class]**]] =
{that Bernhard taught the class, that Rajesh taught the class}

Karttunen style semantics for *know*

(36) Theodore knows [which instructor taught the class].
(37) [[α **know** β]] = that for every $p \in$[[β]]: p is true $\rightarrow$ [[α]] knows p

Exhaustivity in individual questions

(38) Which books has John read?

(39)

1. *The Venetian Affair (TVA)*	YES
2. *The Big Sleep (TBS)*	YES
3. *Journey into Fear (JIF)*	NO

Following Karttunen and Rullmann, let us ignore the semantic effect of plural morphology and assume that [[**book**]] = [[**books**]] = [$\lambda y \in D$. that y is a book].

(40) [[**which books 1 [John has read t_1]**]] =
{that John read *TVA*,
that John read *TBS,*
that John has read *JIF*}

(41) Theodore knows which books John has read.

Karttunen's semantics for questions and *know* predicts that this sentence can be true in our scenario without Theodore knowing that John hasn't read *JIF*. Like Groenendijk and Stokhof (1982), Rullmann takes this prediction to be incorrect.

(42) Theodore knows which books John has read

Theodore knows that John has read *TVA*
Theodore knows that John has read *TBS*
! Theodore knows that John has not read *JIF*

Exhaustivity through maximality

Rullmann proposes a variant of the Karttunen-style *wh*-question rule shown above. He does not offer a general rule, but the following seems close to what he intends.

(43) [[**wh** α β]] = {that max{y: [[β]](y) is true} = x: [[α]]$^+$(x) is true }

This rule presupposes that the domain of individuals includes "sums" of individuals like *TVA* + *TBS* in addition to atomic individuals like *TVA* or *TBS*. The maximum of a set of individuals is the sum of all the individuals in this set. For example, the maximum of {*TVA*, *TBS*, *JIF*} is the sum individual *TVA* + *TBS* + *JIF*. The variable x in the rule ranges not just over atomic individuals, but also over sums. The condition "[[α]]$^+$(x) is true" abbreviates "x is a sum of one or more individuals y for which [[α]](y) is true".

(44) [[**which books 1 [John has read t_1]**]] =
{that max{y: John has read y} = *TVA*,
that max{y: John has read y} = *TBS*,
that max{y: John has read y} = *JIF*,
that max{y: John has read y} = *TVA* + *TBS*,
that max{y: John has read y} = *TVA* + *JIF*,
that max{y: John has read y} = *TBS* + *JIF*,
that max{y: John has read y} = *TVA* + *TBS* + *JIF*}

Rullmann proposes that such a variant of the Karttunen-style rule derives the desired inference pattern for cases of *know* plus interrogative.

Maximality in degree questions

(45) How long did it take?

In the logical forms below, Δ is taken to denote a property of appropriate degrees.

(46) [[**how Δ 1 [it did take t_1 long]]**]] =
{that max{d: it took d-long} = 1 hour,
that max{d: it took d-long} = 2 hours,
that max{d: it took d-long} = 3 hours, …}

Rullmann takes the maximum of a set of degrees to be the greatest degree in that set, rather than the group or "sum" of all the degrees in that set.

(47) * How long didn't it take?

(48) [[**how Δ 1 [it did take t_1 long]]**]] =
{that max{d: it did not take d-long} = 1 hour,
that max{d: it did not take d-long} = 2 hours,
that max{d: it did not take d-long} = 3 hours, …}

Maximality in *how many* questions

(49) How many books has John read?

(50) [[**how Δ 1 [[t_1 many books] 2 [John has read t_2]]**]] =
{that max{d: John has read d-many books} = 1,
that max{d: John has read d-many books} = 2,
that max{d: John has read d-many books} = 3, … }

Rullmann suggests that the maximality analysis also derives the lack of ambiguity in negative *how many* questions. The following example illustrates.

(51) How many books has John not read?

(52) [[**how Δ 1 [[t_1 many books] 2 [not [John has read t_2]]]**]] =
{that max{d: there are d-many books that John has not read} = 1,
that max{d: there are d-many books that John has not read} = 2,
that max{d: there are d-many books that John has not read} = 3, …}

(53) [[**how Δ 1 [not [[t_1 many books] 2 [John has read t_2]]]**]] =
{that max{d: it is not the case that John has read d-many books} = 1,
that max{d: it is not the case that John has read d-many books} = 2,
that max{d: it is not the case that John has read d-many books} = 3, …}

Problems for the maximality account

Beck and Rullmann (1999) observe that Rullmann's (1995) maximality analysis does not always make the correct predictions on interpretation and acceptability. Suppose our marble cake recipe calls for two eggs.

(54) How many eggs are needed?

(55) [[**how ∆ 1 [t_1 many eggs are needed**]] =
{that max{d: d-many eggs are needed} = 1,
that max{d: d-many eggs are needed} = 2,
that max{d: d-many eggs are needed} = 3, … }

We need two eggs to make the cake and we do not need any more than that. Therefore the maximum of {d: d-many eggs are needed} is 2.

(56) How many eggs are sufficient?

(57) [[**how ∆ 1 [t_1 many eggs are sufficient**]] =
{that max{d: d-many eggs are sufficient} = 1,
that max{d: d-many eggs are sufficient} = 2,
that max{d: d-many eggs are sufficient} = 3, … }

Two eggs are sufficient to make the cake. If two eggs are sufficient, then of course any greater number of eggs is sufficient as well. Accordingly, the set {d: d-many eggs are sufficient} does not have a maximum.