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PAUL LAW

ADVERBS IN A-NOT-A QUESTIONS IN MANDARIN CHINESE*

This paper argues that the distribution of adverbs in A-not-A questions bears on the base-position of an abstract morpheme Q and is subject to the same general locality condition on variable binding. It claims that adverbs that have semantic relations with an element in the clause or the clause itself mostly allow inference and interact syntactically with the A-not-A operator, whereas those having no such relations do not. It shows that the lack of syntactic interaction between temporal and locative adverbs on the one hand and the A-not-A operator on the other follows directly from their being related to the world and time coordinates of the formal interpretive model.

1. Introduction

In English, a (matrix) yes/no question is formed by Subject-Auxiliary Inversion (with the auxiliary *do* if no other auxiliary verb is present):

(1)a. John is reading the book.
b. Is John reading the book?

(2)a. John danced.
b. Did John dance?

whereas in Mandarin Chinese, a yes/no question may be formed by copying the verb (or the first syllable of the verb) with the negation *bu* intervening between the copy and the original:

(3)a. Zhangsan kan shu.
read book
'Zhangs reads books.'

b. Zhangsan kan-bu-kan shu?
read-not-read book
'Does Zhangsan read books?'

(4)a. Zhangsan tiaowu.
dance
'Zhangsan dances.'

b. Zhangsan tiao-bu-tiaowu?
TIAO-not-dance
'Does Zhangsan dance?'

For descriptive convenience, I will refer to the predicate preceded by a copy of itself (or its first syllable) and negation as the A-not-A predicate.

It is perhaps surprising that while the presence of an adverb has little effect in yes/no questions in English, it may render them ungrammatical in Chinese if the adverb appears to the left of the A-not-A predicate:

(5)a. John is attentively reading the book.
b. Is John attentively reading the book?

(6)a. John often danced.
b. Did John often dance?

(7)a. Zhangsan xiaoxin de kan shu.
carefully read book
'Zhangsan is carefully reading books.'

b. *Zhangsan xiaoxin de kan-bu-kan shu?
carefully read book
'Is Zhangsan carefully reading books?'

(8)a. Zhangsan changchang tiaowu.
often dance
'Zhangsan often dances.'

b. *Zhangsan changchang tiao-bu-tiaowu?
often TIAO-not-dance
'Does Zhangsan often dance?'

The Chinese counterparts to (5b) and (6b) may be expressed as in (9a) and (9b) respectively where the adverb occurs to the right of the A-not-A form of the focus particle *shi*, possibly a copula verb like the auxiliary *be* in English:

(9)a. Zhangsan shi-bu-shi xiaoxin de kan shu?
be-not-be carefully read book
'Is Zhangsan carefully reading books?'

b. Zhangsan shi-bu-shi changchang tiaowu?
be-not-be often dance
'Does Zhangsan often dance?'

A further complication is that some adverbs, like temporal and locative ones, may appear either to the left or to the right of an A-not-A predicate:[1]

(10)a. Zhangsan mingtian lai-bu-lai?
Zhangsan tomorrow come-not-come
'Is Zhangsan coming tomorrow?'

b. Zhangsan zai jia li zuo-bu-zuo gongke?
Zhangsan at home do-not-do homework
'Does Zhangsan do homework at home?'

(11)a. Zhangsan shi-bu-shu mingtian lai?
Zhangsan be-not-be tomorrow come-not-come
'Is Zhangsan coming tomorrow?'

b. Zhangsan shi-bu-shi zai jia li zuo gongke?
Zhangsan be-not-be at home do homework
'Does Zhangsan do homework at home?'

Three problems naturally arise: why manner and frequency adverbs and many others may not stand to the left of the A-not-A predicate, why temporal, locative adverbs and some others should differ in being able to appear either to the left or right of an A-not-A predicate, and why English should differ from Chinese in that the distinction between different classes of adverbs has no bearing on their occurrence in yes/no questions. To attain a certain level of explanatory adequacy (Chomsky 1965), we need to bring other properties of Chinese grammar as well as independent differences between English and Chinese to bear on these questions.

In this paper, I argue that the grammatical patterns of yes/no questions containing adverbs are related to the base-position of an abstract feature [+Q]. Specifically, Q is base-generated adjoining to the VP in A-not-A Chinese questions (Ernst 1994), which as a logical operator subsequently moves to SpecCP, while Q in English is base-generated in C (section 2). I discuss the various empirical and conceptual issues with the scope of Q and the positions of adverbs of different classes and claim that the reason why most adverbs cannot appear to the left of the A-not-A predicate is due in part to the movement of Q to SpecCP, giving rise to an antecedent-trace relation that is subject to a general locality constraint on variable binding (Aoun and Li 1993) (section 3). The syntactic distributions of different classes of adverbs in A-not-A questions bear directly on whether or not they are semantically related to the predicate or its arguments in the same clause,

or to the proposition in the scope of the A-not-A operator. The two classes of adverbs have different inference and syntactic properties. Adverbs having a semantic relation with the predicate (manner and degree adverbs), an argument of the predicate (Agent-oriented, subject-oriented, instrumental, aspectual, ordinal and reason adverbs), or the proposition (epistemic, frequency and modal adverbs) largely allow inference and interact syntactically with the A-not-A operator in the clause, whereas those having no such semantic relation (domain, speaker/hearer-oriented, locative and temporal adverbs) do not. I argue that locative and temporal adverbs are in fact related to the world and time coordinates of the formal interpretive model, explaining why they may intervene between the A-not-A operator and its trace, just like domain and speaker/hearer adverbs (section 4). If my analysis is correct, it sheds some light on the extent to which semantic relations manifest themselves in syntax, i.e., the extent to which certain syntactic effects (or lack there of) are semantically grounded (section 5).

2. The Base Position of the A-not-A Operator

Huang (1991: 316) suggests that A-not-A questions contain an interrogative INFL constituent with an abstract feature [+Q]. It is realized by a reduplication rule, which copies a sequence immediately following INFL and inserts the morpheme *bu* 'not' between the original and its copy. Depending on the length of the reduplicated sequence, the result can be any one of the forms in (12):

(12)a. ta xi-bu-xihuan zheben shu?
he xi-not-like this book
'Does he like or not like this book?'

b. ta xihuan bu xihuan zheben shu?
he like not like this book
'Does he like or not like this book?'

c. ta xihuan zheben shu bu xihuan zheben shu?
he like this book not like this book
'Does he like or not like this book?'

Moreover, the interrogative INFL constituent with the abstract feature [+Q], represented here as A-not-A, an operator of sorts, moves to the same position as that for *wh*-phrases, presumably SpecCP (Huang 1982: 279, also

cf. Huang 1991: 323). The LF-representations for the examples in (7b) and (8b) would appear respectively as in (13a) and (13b):[2]

(13)a. *[$_{CP}$ A-not-A$_i$ [[$_{IP}$ Zhangsan [t_i [$_{VP}$ xiaoxin de [$_{VP}$ kan shu]]]]]
b. *[$_{CP}$ A-not-A$_i$ [[$_{IP}$ Zhangsan [t_i [$_{VP}$ changchang [$_{VP}$ tiaowu]]]]]

If questions in English contain an abstract Q morpheme in clause-initial position (Baker 1970), which later work takes to be C, then the structures in (13) would be very similar to those in (14) for the English examples in (5b) and (6b):

(14)a. [$_{CP}$ is$_i$ + Q [$_{IP}$ John [t_i [$_{VP}$ attentively [$_{VP}$ reading the book]]]]
b. [$_{CP}$ did$_i$ + Q [$_{IP}$ John [t_i [$_{VP}$ often [$_{VP}$ dance]]]]

There is then no obvious difference between the structures in (13) and those in (14) that we can bring to bear on the grammatical contrasts between the examples in (7b) and (8b) on the one hand, and those in (5b) and (6b) on the other. Despite its different origins in the two languages, Q c-commands the adverb to its right in both (13) and (14).

In fact, it is by no means self-evident that the abstract [+Q] in Chinese originates in INFL. Suppose Q originates not in INFL as Huang suggests but in the VP (Ernst 1994: 256). More specifically, I suggest that the A-not-A operator is base-generated adjoining to a VP-projection of V; movement of the A-not-A operator to SpecCP would yield the representation in (15a):

(15) [$_{CP}$ A-not-A$_i$ [… [$_{VP}$ t_i [$_{VP}$ [$_{V'}$ … V …]]]] …

In the configuration in (15), either the predicate immediately following the A-not-A operator or the VP sister to it is required to take on the A-not-A form, similar to Huang's original proposal. Structures of the sort in (16) can be generated:

(16)a. [$_{CP}$ A-not-A$_i$ [$_{IP}$ Zhangsan
[$_{VP}$ t_i [$_{VP}$ xiao-bu-xiaoxin de [$_{VP}$ kan shu]]]]?
xiao-not-carefully read book
'Is Zhangsan carefully reading books?'

b. [$_{CP}$ A-not-A$_i$ [$_{IP}$ Zhangsan [$_{VP}$ t_i [$_{VP}$ chang-bu-chang [$_{VP}$
often-not-often
tiaowu]]]]?
dance
'Does Zhangsan often dance?'

Along these lines, the LF-representations for the examples in (7b)–(8b) would be different from their English counterparts in (5b) and (6b):

(17)a. *[$_{CP}$ A-not-A$_i$ [$_{IP}$ Zhangsan [[$_{VP}$ xiaoxin de [$_{VP}$ t_i kan shu]]]]
b. *[$_{CP}$ A-not-A$_i$ [$_{IP}$ Zhangsan [[$_{VP}$ changchang [$_{VP}$ t_i tiaowu]]]]

The representations in (14) obviously differ from those in (17) in the position of the adverb with respect to the A-not-A operator and its trace. The adverb intervenes between the two in (17) but not in (14). In other words, the adverb induces an intervention effect in Chinese but not in English, as it appears between the A-not-A operator and its trace in Chinese but not in English.

The lack of the intervention effect of the adverb in (9) where the adverb occurs to the right of the A-not-A predicate further corroborates the idea that the adverb may not intervene between the A-not-A operator and its trace. In their LF-representations in (18), the adverb does not intervene between the two:

(18)a. [$_{CP}$ A-not-A$_i$ [$_{IP}$ Zhangsan t$_i$ shi [$_{VP}$ xiaoxin de [$_{VP}$ kan shu]]]]
b. [$_{CP}$ A-not-A$_i$ [$_{IP}$ Zhangsan t$_i$ shi [$_{VP}$ changchang [$_{VP}$ tiaowu]]]]

We thus have fairly good evidence that the abstract [+Q] morpheme in yes/no questions, the A-not-A operator, originates in the VP in Chinese, but in C in English.

The configuration in (17) recalls Rizzi's (1990) Relativized Minimality (RM) theory according to which a phrase in an A-bar position may not bind a trace if another phrase in A-bar position intervenes between the two. In (17), the adverb clearly intervenes between the A-not-A operator and its trace. RM thus bars the A-not-A operator from binding its trace; as a result, the trace fails to be antecedent-governed. Being unselected, it is also not head-governed by a lexical head, ultimately violating Chomsky's (1981) Empty Category Principle (ECP) (cf. Chomsky 1981: 165, 250 for the definition of government and proper government).

RM has some intuitive appeal, and variants of it have emerged in work on locality in syntax. Nevertheless, RM by itself is not sufficient to account for the distribution of adverbs in A-not-A questions since temporal and locative adverbs may, but most other adverbs may not, appear to the left of the A-not-A predicate. Not only do we need to distinguish two types of adverbs, we must also bring the distinction to bear on other aspects of grammar in order to arrive at an explanatorily adequate account for why they have the distributions they do.

3. Scope of the A-not-A Operator and the Locality Constraint on Adverbs

While it seems relatively clear that some variant of RM continues to hold, it is not immediately obvious what other principles of grammar are involved in the distribution of adverbs in A-not-A questions, and how general these are.

I argue that to a great extent general syntactic principles apply to the syntax of adverbs, but the lexical property of particular adverbs bearing on the semantics may lead to different syntactic distributions. In particular, the occurrence of adverbs in A-not-A questions is subject not to a constraint on the relative positioning of scope-bearing elements at S-structure and LF but to the same locality constraint on variable binding at LF.

3.1. *Locality Constraint on Scope-bearing Elements and Different Classes of Adverbs*

Ernst (1994: 245) claims that the relative positioning of adverbs and the abstract Qu morpheme (represented as the A-not-A operator in this paper) in A-not-A questions is subject to the same constraint on scope in Chinese (Huang 1982):

(19) The Isomorphic Principle (IsoP)
If an operator A has scope over B at S-Structure,
then A has scope over B at LF.

Thus, the adverb *yiding* 'definitely' in the declarative example in (20a) does not raise, if no grammatical principle requires it to do so (the LF-representation in (20c) is original):

(20)a. ta yiding qu.
he definitely go
'He is definitely going?'

b. *ta yiding qu-bu-qu?
he definitely go-not-go
'Is he definitely going?'

c. LF: *yiding$_j$ qu + [Qu]$_i$ [ta t_j t_i]

However, in (20b) when Qu raises at LF, the adverb c-commanding Qu at S-structure must in turn raise as well, as in (20c) (Ernst 1994: 246), as required by the IsoP. But the resulting LF-representation is semantically anomalous since adverbs like *yiding* 'definitely' may not take questions in their scope. These adverbs operate on a proposition or state of affairs.

The example in (20b) is thus excluded for the same reason the English example in (21) is excluded (Ernst 1994: 247):

(21) *Definitely, is she coming?

The same account can be given to explain the ungrammaticality of the examples in (7b) and (8b). Their LF-representations in (22) show that after the raising of Qu, the manner adverb *xiaoxin de* 'carefully' or the frequency adverb *changchang* 'often' must also raise to c-command Qu to observe the IsoP:

(22)a. *xiaoxin de$_j$ kan + [Qu]$_i$ [Zhangsan t_j t_i shu]
b. *changchang$_j$ tiaowu + [Qu]$_i$ [Zhangsan t_j t_i]

But in these representations, the adverbs have scope over the questions since they c-command Qu. They are then ruled out for semantic reasons, for manner adverbs operate on properties, that is, they map properties to properties, not on questions.

In fact, Ernst's account carries over to a range of other adverbs. As shown in (23)-(28), a manner, degree, ordinal, aspectual, Agent-oriented and reason adverb may not occur to the left of the A-not-A predicate:[3]

(23)a. *ta luan pao-bu-pao? (manner)
he chaotically run-not-run
'Is he running all over the place?'

b. LF: *luan$_j$ pao + [Qu]$_i$ [ta $t_j t_i$]

(24)a. *ta hen congming-bu-congming? (degree)
he very smart-not-smart
'Is he very smart?'

b. LF: *hen$_i$ congming + [Qu]$_j$ [ta t_i t_j]

(25)a. *Xiaolan xian zou-bu-zou? (ordinal)
first leave-not-leave
'Is Xiaolan leaving first?'

b. LF: *xian$_i$ zou + [Qu]$_j$ [Xiaolan t_i t_j]

(26)a. *laoban yanli de ze-bu-zebei ta? (Agent-oriented)
boss sternly ZE-not-accuse him
'Does the boss sternly accuse him?'

b. LF: *yanli de$_i$ zebei + [Qu]$_j$ [laoban t_i t_j ta]

(27)a. *ta turan you-mei-you xinglai? (aspectual)
he suddenly have-not-have wake up
'Did he wake up suddenly?'

b. LF: *turan$_i$ xinglai + [Qu]$_j$ [ta t_i t_j]

(28)a. *ni yinwei nide pengyou de yaoqiu qu-bu-qu? (reason)
you because your friend DE demand go-not-go
'Are you going because of your friend's demands?'

b. LF: *yinwei nide pengyou de yaoqiu$_i$ qu + [Qu]$_j$ [ni t_i t_j]

The LF-representations in (23)–(28) are on a par with those in (20c) and (22). The adverbs c-commanded by Qu at S-structure must raise at LF to c-command it, as required by the IsoP. The LF-representations in (23)–(28) are semantically anomalous since the adverbs have scope over the questions.

The problem, however, is that some adverbs may occur to the left of the A-not-A predicate. Apart from temporal and locative adverbs, domain adverbs too may appear to the left of the A-not-A predicate:

(29)a. ni jintian qu-bu-qu? (temporal)
you today go-not-go
'Are you going today?'

b. ni zai nar chi-bu-chi rou? (locative)
you at there eat-not-eat meat
'Do you eat meat over there?'

c. Zhejian shi cong zhengzhi shang de jiaodu
this matter from politics on DE angle
xing-bu-xing? (domain)
OK-not-OK
'From a political point of view, is this matter OK?'

The LF-representations in (30) are evidently comparable to those in (22)–(28), yet these must be allowed, since the examples in (29) they respectively represent are grammatical:

(30)a. LF: jintian$_i$ qu + [Qu]$_j$ [ni t_i t_j]
b. LF: zai nar$_i$ chi + [Qu]$_j$ [ni t_i t_j rou]
c. LF: cong zhengzhi shang de jiaodu$_i$ xing + [Qu]$_j$ [zhejian shi t_i t_j]

Obviously, we need to distinguish temporal, locative and domain adverbs on the one hand, and other adverbs on the other, and bring the distinction to bear on the issue of why the former may, but the latter may not, occur to the left of the A-not-A predicate.

3.2. *T/I Adverbs vs Core Adverbs*

Ernst (1994: 243, 248) argues that temporal, locative and domain adverbs differ from core adjuncts like those in (23)–(28) in that they are like arguments, their interpretations depending on a connection to the verb (or Infl) (Ernst 1994: 251). For our purposes here, I will use adjuncts and adverbs interchangeably.

According to Ernst, locatives are theta-marked adjuncts and must be connected to the verb in order to be properly interpreted as participants of the event represented by the verb, while temporal adjuncts are interpreted with relation to Infl, which is frequently encoded by means of an index with Infl in a formal model (cf. Dowty 1979). Ernst takes domain adverbs to be related to this model like temporal adverbs since they do not participate in scope relationships in the normal way for adjuncts but affect the range of presuppositions by which the whole proposition is interpreted, as discussed in Ernst (1984: 39ff). Thus, these 'T/I' ('Theta/Infl') adjuncts require a trace for semantic interpretation. In contrast, core adjuncts, the class of adverbs to which *yiding* 'definitely' and *luan* 'chaotically' belong, cannot occur to the left of the A-not-A predicate. They need not be linked to any particular semantic locus in order to be interpreted at LF; instead, they simply modify what they c-command, wherever they are at LF.

Ernst (1994: 252) suggests that scope is generally subject to the principle in (31), where a "level-relevant" trace is defined as a trace that plays a role at a particular level of representation:

(31) Scope Principle
A has scope over B if A c-commands a level-relevant member of the chain containing B.

Traces are level-relevant at S-Structure if they play a syntactic role, such as for binding or the ECP, and are level-relevant at LF if they play a semantic role.

In the LF-representation in (32a) for the example in (29a), the trace t_i of the adverb *jintian* 'today', a T/I adjunct, is level-relevant at LF, and Qu c-commands it; hence, Qu has scope over the adverb (Ernst 1994: 252):

(32)a. LF: jintian$_i$ qu + [Qu]$_j$ [ni t_i t_j] (cf. (29a))
b. LF: *yiding$_i$ qu + [Qu]$_j$ [ta t_i t_j] (= (20c))

However, in the LF-representation in (32b) for the example in (20b), the trace t_i of the adverb *yiding* 'definitely', a core adjunct, is not level-relevant at LF. Qu thus does not have scope over the adverb, even though it c-commands the trace. However, in this representation, the adverb *yiding* 'definitely' c-commands Q and thus has scope over it—a semantic anomaly. Notice that for the same reason, the LF-representation in (32a) admits a semantically anomalous reading in which the temporal adverb *jintian* 'today' has scope over the question. But this is inconsequential as the structure also allows, correctly, for the reading in which the adverb is in the scope of Q.[4]

In sum, in Ernst's account, there are two classes of adverbs: core adjuncts and T/I adjuncts. Core adjuncts must raise at LF to c-command Qu when Qu raises at LF to observe the IsoP, if they c-command Qu at S-structure. Moreover, while traces of T/I-related adjuncts are level-relevant at LF, traces of core adjuncts are not, these being unrelated to T/I. The difference plays a crucial role in explaining the distributions of the adverbs in A-not-A questions.

3.3. *Some Conceptual and Empirical Problems*

Despite the impressive range of facts for which it can account, there are some reasons to believe that Ernst's account is not quite correct. As we will see, the analysis relying on the IsoP and the concomitant assumption of LF-raising of adverbs are problematic in many respects.

3.3.1. *Raising of VP-adverbs*

While it may seem reasonable to assume that adverbs like *yiding* 'definitely' raise to the clause-initial position at LF, for they take propositions in their scope, there is no reason to believe that the same is true of manner adverbs like *luan* 'chaotically' or degree adverbs like *hen* 'very'.

Manner adverbs and degree adverbs clearly have VP-scope. The former map properties to properties, and the latter predicate of a property in asserting the degree to which the property holds. Thus, unless it can be shown that raising of these adverbs is independently motivated, it is doubtful that the examples in (33a) and (34a) respectively have the LF-representions in (33b) and (34b):

(33)a. ta luan pao. (manner)
he chaotically run
'He runs all over the place.'

b. LF: [$_{IP}$ luan$_i$ [$_{IP}$ ta t_i pao]]

(34)a. ta hen congming. (degree)
he very smart
'He is very smart.'

b. LF: [$_{IP}$ hen$_i$ [$_{IP}$ ta t_i congming]]

Similarly, there is apparently no reason for raising the ordinal and Agent-oriented adverbs in (35a) and (36a) to yield the LF-representations in (35b) and (36b) respectively:

(35)a. Xiaolan xian zou. (ordinal)
first leave
'Xiaolan is leaving first.'

b. LF: [$_{IP}$ xian$_i$ [$_{IP}$ Xiaolan t_i zou]]

(36)a. laoban yanli de zebei ta. (Agent-oriented)
boss sternly accuse him
'The boss sternly accused him.'

b. LF: [$_{IP}$ yanli de$_i$ [$_{IP}$ laoban t_i zebei ta]]

The ordinal adverb *xian* 'first' in (35a), as it is used here, predicates of the event *zou* 'leaving', that is, it took place before some other event, but the structure in (35b) incorrectly represents the adverb as having scope over the proposition that Xiaolan left. Likewise, the Agent-oriented adverb *yanli* 'sternly' in (36a) predicating of the Agent argument *laoban* 'the boss' is incorrectly represented in (36b) as having scope over the proposition that the boss accused him. At any rate, raising of manner, degree, ordinal and Agent-oriented adverbs to the clause-initial position at LF would yield incorrect interpretations.

The grammaticality of the a-examples in (33)–(36) shows that the adverbs can be interpreted in-situ. There is then no reason why they cannot be interpreted in-situ in the a-examples in (23)–(26). Moreover, if raising of the adverbs cannot be independently justified in (33)–(36), then it is doubtful that they raise in (23)–(26). It is for a highly theory-internal reason, that is, solely because of the IsoP, that the LF-representations in (23)–(26) arise. If this is correct, then the explanation for the ungrammaticality of the a-examples in (23)–(26) lies elsewhere.

3.3.2. *Different Classes of Adjuncts and Level-relevant Traces*

Although it is clear that different adverbs are related to different elements in the sentence, for instance temporal adverbs are related to T/I and manner

adverbs to verbs, it is not obvious that the difference is due to whether their traces are level-relevant.

In fact, if anything, traces of core adjuncts like manner adverbs or reason adverbs are required for interpretation, and are thus level-relevant: that is, if the example in (37a) is ruled out the same way as that in (23a), i.e., Qu does not have scope over the adverb, its trace not being level-relevant:

(37)a. *Zhangsan wei qian zou-bu-zou?
because money leave-not-leave
'Did Zhangsan leave because of money?'

b. LF: *wei qian$_i$ zou + [Qu]$_j$ [Zhangsan t_i t_j]

then we might wonder why it should be that in contrast with these, traces arising from *wh*-movement are level-relevant. The ambiguity of examples like those in (38) is commonly taken to be due to the different positions of the trace in a local relation with the predicate they modify:[5]

(38)a. [$_{IP}$ Zhangsan shuo [$_{IP}$ Lisi bei jie gu]] de yuanyin.
say bei dissolve employ DE reason
'The reason why Zhangsan said Lisi was fired.'

b. LF: [$_{IP}$ Zhangsan t_i shuo [$_{IP}$ Lisi bei jiegu]] de yuanyin$_i$.
'The reason of Zhangsan's saying that Lisi was fired.'

c. LF: [$_{IP}$ Zhangsan shuo [$_{IP}$ Lisi t_i bei jiegu]] de yuanyin$_i$.
'The reason of Lisi being fired according to Zhangsan.'

(39)a. [$_{IP}$ tamen xuanbu [$_{IP}$ Lisi dang xuan]] de fangfa.
they announce get elect DE method
'The way in which they announced Lisi got elected.'

b. LF: [$_{IP}$ tamen t_i xuanbu [$_{IP}$ Lisi dang xuan]] de fangfa$_i$.
'The way they made the announcement that Lisi got elected.'

c. LF: [$_{IP}$ tamen xuanbu [$_{IP}$ Lisi t_i dang xuan]] de fangfa$_i$.
'The way Lisi got elected according to their announcement.'

Thus, to the extent that the ambiguity of the examples in (38a) and (39a) is represented by the different positions of the trace, traces of reason and manner adverb undergoing *wh*-movement are required for interpretation and hence are level-relevant.

Island effects at LF exhibited by abstract movement (Huang 1982: 527) also suggest that traces of reason and manner *wh*-phrases are subject to

syntactic principles like the Huang's Condition on Extraction Domain (CED), just like overt movement of these adverbs in English:[6]

(40)a. *[$_{NP}$ [$_{IP}$ ta weisheme xie] de shu] zui youqu?
he why write DE book most interesting
'Books that he wrote why are interesting?'
b. LF: *weisheme$_i$ [$_{NP}$ [$_{IP}$ ta t_i xie de shu]] zui youqu.

(41)a. *[$_{NP}$ [$_{IP}$ ta zenme xie] de shu] zui youqu?
he how write DE book most interesting
'Books that he wrote how are interesting?'
b. LF: *zenme$_i$ [$_{NP}$ [$_{IP}$ ta t_i zie de shu]] zui youqu.

(42)a. *Why$_i$ are [$_{NP}$ books [$_{CP}$ that he wrote t_i]] interesting?
b. *How$_i$ are [$_{NP}$ books [$_{CP}$ that he wrote t_i]] interesting?

Thus, the examples in (40a) and (41a) can be excluded just like those in (42) if their LF-representations in (40b) and (41b) contain a trace like that found in (42).

Therefore, to the extent that the ambiguous interpretations of a manner or reason *wh*-phrase are due to its being extracted from different positions represented by a trace, and the trace is subject to syntactic principles like the CED, these adverbs too should leave level-relevant traces at S-structure and LF.

Finally, it does not appear possible to maintain that T/I adverbs leave level-relevant traces and yet do not participate in scope relationships. If the reason why the T/I adverb *jintian* 'today' in the structure in (32a) is under the scope of Qu is because Qu c-commands the level-relevant trace of the adverb, then we must conclude that T/I adverbs interact scopally with other elements in the sentence.

3.4. *A Structural Constraint on Variable Binding*

Ernst's account crucially relies on the IsoP. It is precisely because of the IsoP that adverbs c-commanding Qu must raise at LF to c-command Qu when Qu raises. The result is that adverbs that semantically cannot take questions in their scope come to be in a position where they have scope over the questions. If the IsoP itself is inadequate, then there is no longer reason to assume that adverbs are required by the IsoP to raise at LF.

The IsoP is motivated primarily by the fact that scope in Chinese is largely determined by the surface position of the scope-bearing element.

Thus, in contrast with the ambiguous sentences in English in (43), their Chinese counterparts in (44) are unambiguous (cf. Huang 1981):

(43)a. Every student bought some book.
'For every student *x*, there is some book *y* such that *x* bought *y*.'
or 'There is some book *y*, for every student *x* such that *x* bought *y*.'

b. Everyone arrested some woman.
'For every person *x*, there is some woman *y* such that *x* arrested *y*.'
or 'There is some woman *y*, for every person *x*, such that *x* arrested *y*.'

(44)a. meige xuesheng dou mai-le yiben shu.
every student all buy-Perf one book
'For every student *x*, there is one book *y* such that *x* bought *y*.' OK
'There is some book *y*, for every student *x* such that *x* bought *y*.' *

b. meigeren dou zhuazou yige nuren.
everyone all arrest one woman
'For every person *x*, there is one woman *y* such that *x* arrested *y*.' OK
'There is some woman *y*, for every person *x*, such that *x* arrested *y*.' *

The IsoP correctly predicts that in Chinese the object quantifier cannot have scope over the subject, since the LF-representation for the object-wide scope reading has the reverse c-command relation between the subject and the object:

(45)a. S-structure: … subject_i … object_j …
b. LF: *… object_j … subject_i … t_i … t_j …

But as Aoun and Li (1993: 17–19) point out, the IsoP does not account for why in passive the logical subject quantifier may have scope over the logical object quantifier in surface subject position, even though it does not c-command it. The example in (46a) is just as ambiguous as its English counterpart, allowing a reading where the logical subject quantifier *yigen nuren* 'a woman' in the *bei*-phrase has scope over the logical object quantifier *zhishao sange ren* 'at least three persons' in a surface subject position that it does not c-command:[7]

(46)a. zhishao sange ren bei yige nüren zhuazou-le.
at least three person by one woman arrest-ASP
'At least three persons were arrested by a woman.'

b. S-structure: [$_{IP}$ zhishao sange ren$_i$ [bei yigen nuren$_j$ [$_{VP}$ t_j [zhuazou-le t_i]]]]

c. LF: [$_{IP}$ zhishao sange ren$_i$ [$_{IP}$ t_i [bei yigen nuren$_j$ [$_{VP}$ t_j [zhuazou-le t_i]]]]]

If quantifier scope is determined by the principle in (47), the same as that in (31) without the mention of 'level-relevant' (Aoun and Li 1993: 21):

(47) The Scope Principle
A may have scope over a B iff A c-commands a member of the chain containing B.

then the example in (46a) is correctly predicted to be ambiguous. In the LF-representation in (46c), the surface subject quantifier *zhishao sange ren* 'at least three persons' c-commands the quantifier *yigen nuren* 'a woman' in the *bei*-phrase, and hence has scope over it. Moreover, the (logical subject) quantifier *yigen nuren* 'a woman' in the *bei*-phrase c-commands the trace of the surface subject quantifier *zhishao sange ren* 'at least three persons' in the VP; hence, it has scope over it. An account is thus provided for the ambiguity of the example in (46a).

Aoun and Li (1993: 22ff) attribute the interpretive difference between the English examples in (43) and those in Chinese in (44) to an independent constituency difference between them. More specifically, they argue that the subject base-generated in SpecVP (Koopman and Sportiche 1985, Kuroda 1988) raises to SpecIP in English, but does not do so in Chinese (cf. Aoun and Li 1989), due to the degenerate nature of Infl in this language. The difference beween English and Chinese at S-structure would be as in (48):

(48)a. [$_{IP}$ NP$_i$ [I [$_{VP}$ t_i [V]]]] (English)
b. [$_{IP}$ [I [$_{VP}$ NP [V]]]] (Chinese)

For the English examples in (43), the subject quantifier moves from SpecVP to SpecIP at S-structure, and then at LF can raise adjoining to IP, while the object quantifier can raise at LF adjoining to VP, as in (49):

(49)a. [$_{IP}$ every student$_i$ [$_{IP}$ t_i [$_{VP}$ some book$_j$ [$_{VP}$ t_i [bought t_j]]]]]
b. [$_{IP}$ everyone$_i$ [$_{IP}$ t_i [$_{VP}$ some woman$_j$ [$_{VP}$ t_i [arrested t_j]]]]]

In these representations, the subject quantifier has scope over the object quantifier, since it c-commands it. Moreover, because the object quantifier c-commands the trace of the subject quantifier in SpecVP, it has scope over the subject quantifier. This accounts for the ambiguity of the examples in (43).

However, the LF-representations in (50) for the same examples, where the object quantifier is adjoined to IP, are ruled out by the locality constraint on variable binding in (51) (Aoun and Li 1993: 19):[8]

(50)a. *[$_{IP}$ some book$_j$ [$_{IP}$ every student$_i$ [t_i [$_{VP}$ bought t_j]]]]
b. *[$_{IP}$ some woman$_j$ [$_{IP}$ everyone$_i$ [$_{IP}$ t_i [$_{VP}$ arrested t_j]]]]

(51) The Minimal Binding Requirement (MBR)
Variables must be bound by the most local potential antecedent (A-bar binder).

In (50), the subject quantifier is the most local potential A-bar binder for both traces. But the trace t_j of the object quantifier is not bound by the most local potential A-bar binder, thus violating the MBR.[9]

A noticeable property of Aoun and Li's account for the ambiguity for the examples in (43) is that their ambiguous interpretations are not due to their different LF-representations, in contrast with most other accounts (cf. May 1985). They are due to the configuration in which the Scope Principle in (47) admits both subject wide-scope and object wide-scope readings.

Let us now turn to the unambiguous Chinese examples in (44). Their LF-representations would be like (52) if the subject quantifier is raised adjoining to IP and the object quantifier to V′, or like (53) if the subject quantifier is raised adjoining to VP and the object quantifier to V′:[10]

(52)a. [$_{IP}$ meigen xuesheng$_i$ [$_{IP}$ [$_{VP}$ t_i [$_{V'}$ yiben shu$_j$ [$_{V'}$ dou maile t_j]]]]]
b. [$_{IP}$ meigeren$_i$ [$_{IP}$ [$_{VP}$ t_i [$_{V'}$ yige nuren$_j$ [$_{V'}$ dou zhuazou t_j]]]]]

(53)a. [$_{IP}$ [$_{VP}$ meigen xuesheng$_i$ [$_{VP}$ t_i [$_{V'}$ yiben shu$_j$ [$_{V'}$ dou maile t_j]]]]]
b. [$_{IP}$ [$_{VP}$ meigeren$_i$ [$_{VP}$ t_i [$_{V'}$ yige nuren$_j$ [$_{V'}$ dou zhuazou t_j]]]]]

In both cases, the subject quantifier has scope over the object quantifier since it c-commands it. These representations also conform to the MBR since each variable is bound by the most local potential A-bar binder.

Just like the LF-representations in (50), those in (54) where the object quantifier is raised adjoining to IP are excluded:

(54)a. *[$_{IP}$ yiben shu$_j$ [$_{IP}$ meigen xuesheng$_i$ [$_{VP}$ t_i [dou maile t_j]]]]
b. *[$_{IP}$ yige nuren$_j$ [$_{IP}$ meigeren$_i$ [$_{VP}$ t_i [zhuazou t_j]]]]

Here, the most local potential A-bar binder for the traces is the subject quantifier. The trace t_j is not bound by the most local potential A-bar binder, thus violating the MBR. This accounts for the unambiguity of the examples in (44).

The difference between the English examples in (43) and those in Chinese in (44) thus crucially hinges on the trace of the subject in SpecVP, present in English but not in Chinese. Notice that according to Aoun and Li (1993: 26), the VP-adjoined subject quantifier in (46c) is not the most local potential A-bar binder for the trace t_i of the logical object in the VP, for this is an A-trace, that is, its antecedent is in SpecIP, an A-position. Thus, no violation of the MBR arises.

3.5. *Interim Conclusion and an Outline of a Solution*

Ernst's account is therefore rather problematic, especially the differentiation of temporal, locative and domain adjuncts from core adjuncts in terms of level-relevant traces. Conceptually, the notion of level-relevant trace has no independent justification, and empirically, it neither captures the ambiguity in long-distance extraction of core adjuncts nor explains why core adjuncts may not occur in syntactic islands. Moreover, the IsoP on which it crucially relies is also empirically inadequate, insofar as it does not extend to the account for the ambiguity of passive sentences in Chinese.

To alleviate these various conceptual and empirical problems, I suggest to bring the MBR, an independent locality constraint on variable binding, to bear on the occurrence of adverbs in A-not-A questions. I argue that the MBR, a syntactic constraint, is applicable to elements in a certain locality only if they bear a semantic relation in that locality. Thus, an adverb is a potential A-bar binder of the trace of the A-not-A operator only if it is semantically related to some element under the scope of the operator.

The semantic relations with many adverbs can be easily established. But for some, the semantic relations are not obvious. For instance, in most views, temporal and locative adverbs are related to the predicate or to the Event argument. But I will argue that they are in fact related to the time and world coordinates of the formal interpretive model, explaining why they may intervene between the A-not-A operator and its trace.

4. Semantic Relations with Adverbs and Variable-Binding in a-not-a Questions

Recall that our original problem is why locative, temporal and a few other adverbs like domain and speaker/hearer-oriented adverbs may occur to the left of the A-not-A predicate but most other adverbs may not. As different adverbs bear different semantic relations with the co-occurring categories, for instance, manner adverbs are related to the predicate while Agent-oriented adverbs are related to the Agent argument, it is natural to bring this independent semantic difference among adverbs to bear on their different syntactic distributions, in particular, their interactions with the A-not-A operator.

Logically, adverbs can be divided into two major classes with respect to the predicate of the sentence: one comprises adverbs that are related to the predicate in some way and one that contains adverbs unrelated to the predicate. The division usually but not always correlates with inference. As it turns out, members of the first class, which I will call predicate-related adverbs for convenience (cf. Ernst's 2002: 41 predicational adverbs), exhibit syntactic interactions with the A-not-A operator, that is, they are potential A-bar binders with respect to the MBR, whereas those of the second class do not.

In what follows, I will first discuss adverbs that clearly fall under one of these two classes (sections 4.1 and 4.2), and bring their semantic difference to bear on their occurrence in A-not-A questions (section 4.3). I will then argue that temporal and locative adverbs are in fact not predicate-related but are members of the second class of adverbs (section 4.4). I show that certain facts concerning negation and adverbs are only an apparent problem for the MBR (section 4.5).

4.1. *Predicate-related Adverbs*

The question of what category an adverb may bear a semantic relation to obviously hinges on what other category appears in the sentence. Since a sentence contains a predicate, its individual-denoting arguments and the Event argument, an adverb thus may logically bear a semantic relation with any one of these categories. The interesting case is the sentence itself. Even though they occur in a position internal to the sentence, some adverbs may bear a semantic relation to the proposition that is the denotation of the sentence without the adverb. If we take the predicate as the central element around which a sentence is constructed, with its arguments, tense and

agreement morphology, then adverbs bearing a semantic relation to any one of these elements are predicate-related.

Manner and degree adverbs are related to the predicate. We understand the manner adverb *luan* 'chaotically' in (55a) as attributing a *chaotic*-property to the predicate *pao* 'run', and the degree adverb *hen* 'very' as predicating of the degree to which the *smart*-property, the denotation of the predicate *congming* 'smart', holds:

(55)a. ta luan pao. (manner)
he chaotically run
'He is running chaotically/all over the place.'

b. ta hen congming. (degree)
he very smart
'He is very smart.'

Insofar as they attribute a property to the category they predicate of, Agent-oriented adverbs are related to the Agent argument and subject-oriented adverbs to the argument in subject position:

(56)a. laoban yanli de zebei ta. (Agent-oriented)
boss sternly accuse him
'Does the boss sternly accuse him?'

b. Zhangsan guyi bei yisheng jiancha. (subject-oriented)
deliberately by doctor examine
'Zhangsan deliberately was examined by the doctor.'

Aspectual, ordinal and reason adverbs appear to bear a semantic relation with the Event argument (Davidson 1967, Parsons 1990, Kratzer 1996). So the aspectual adverb *turan* 'suddenly' attributes the *sudden*-property to the Event of waking up in (57a):

(57)a. Zhangsan turan xinglai. (aspectual)
suddenly wake up
'Zhangsan suddenly woke up.'

b. Er jia er (*turan) dengyü si.
two plus two suddenly equal four
'Two plus two (suddenly) equals four.'

That *turan* 'sudden' predicates of the Event argument is further seen in the ungrammaticality of the example in (57b) with the individual-level predicate *dengyü* 'equal' that lacks an Event argument (Kratzer 1995).

Ordinal adverbs too are related to the Event argument. The ordinal adverb *xian* 'first' in (58a) says of the event of Xiaolan's leaving that it takes place before some other event (most naturally understood to be a leaving-event):

(58) Xiaolan xian zou. (ordinal)
first leave
'Xiaolan is leaving first.'

Reason adverbs relate two events or states of affairs, one is the cause of the other. Thus, the reason adverb *yinwei* 'because' in (59) relates the cause state of affairs, *tade pengyou de yaoqiu* 'because of his friend's demands', to the consequence event, *Zhangsan tiao-le qilai* 'Zhangsan jumped up':

(59) Zhangsan [yinwei [tade pengyou de yaoqiu]] tiao-le qilai.
because his friend DE demand go-Perf up
'Zhangsan jumped up because of his friend's demands.'
(reason)

Instrumental adverbs can be taken to bear a semantic relation with the predicate or with the Event argument. We understand the phrase *yong kuaizi* 'use chopsticks' in (60) as the instrument of either the predicate *chi* 'eat' or the event of eating rice:[11]

(60) Ta yong kuaizi chi fan. (instrumental)
he use chopsticks eat rice
'He uses chopsticks to eat rice.'

Adverbs having semantic relations with propositions that are denotations of the sentences without the adverbs are commonly known as sentential adverbs. The epistemic adverb *xianran* 'obviously' in (61a) is semantically related to the proposition that is the denotation of the sentence without it since it attributes the *obvious*-property to it, as in (61b):

(61)a. Zhangsan xianran yijing likai-le. (epistemic)
obviously already leave-Perf
'Zhangsan obviously has already left.'
b. That Zhangsan has already left is obvious.

Sentential adverbs involving quantification of sorts include frequency and modal adverbs. Semantically, they map propositions to sets of possible worlds. Thus, the frequency adverb *changchang* 'often' in (62a) maps a

proposition to a non-empty set of possible worlds in which the proposition is true,[12] while the modal adverb *dagai* 'probably' in (62b) maps a proposition to two complementary subsets of unequal size that make up the set of all possible worlds, and the proposition is true in the larger set, i.e., a proposition is probably true just in case it is true in more possible worlds or states of affairs:

(62)a. Zhangsan changchang tiaowu. (frequency)
often dance
'Zhangsan often dances.'

b. Zhangsan dagai qu. (modal)
probably go
'Zhangsan will probably go.'

As we can see, the class of predicate-related adverbs encompasses a variety of adverbs relating to different categories in the sentence or to the sentence itself.

A significant semantic property of sentences with most predicate-related adverbs is inference or entailment, a point already made by Maienborn (2001) for locatives. Sentences with manner, degree, Agent-oriented, subject-oriented, aspectual, ordinal, reason, instrument, epistemic and frequency adverbs have this property:

(63)a. John slowly walked → John walked.
b. John is very smart → John is smart
c. John intelligently avoided the question →
John avoided the question
d. John deliberately was examined by the doctor →
John was examined by the doctor
e. John suddenly woke up → John woke up
f. John left first → John left
g. John jumped up because of his friend's demand → John jumped up
h. John ate rice with chopsticks → John ate rice
i. John obviously has left → John has left
j. John often danced → John danced

The inferences in (63) would follow if we take these adverbs to be restricting functions mapping denotations of the categories to which they are related to a subset of the denotations. For instance, the adverb *slowly* in (63a) maps the *walk*-property to a subset of the *walk*-property in which the manner is *slow*. Hence, if the *slow walk*-property is true of *John*, then so is the *walk*-property.

The inference does not hold for the modal adverb *dagai* 'probably'. The sentence in (64a) does not entail that in (64b):

(64)a. John will probably leave $\nrightarrow$
b. John will leave.

The failure of inference in (64) is due to the semantics of the adverb *probably*. There is no guarantee that the set of worlds in which the proposition in (64b) is true is a subset of the larger set that is part of the denotation of the sentence in (64a). Hence, the inference from (64a) to (64b) does not necessarily hold.

Inference is a useful, independent way semantic relations with adverbs can be determined, but the inherent semantic property of the adverb sometimes obscures its applicability, as in (64) and some other cases, as we will see.

4.2. *Domain and Speaker/Hearer-oriented Adverbs*

Domain and speaker/hearer-oriented adverbs differ sharply from predicate-related adverbs in that they do not attribute a property to any element in the sentence or to the sentence itself. For instance, the domain adjunct *cong zhengzhi shang de jiaodu* 'from a political point of view' in (65a) does not attribute a property to anything in the sentence:

(65)a. Zhejian shi
this matter
cong zhengzhi shang de jiaodu bu-xing.
from politics on DE angle not-OK
'From a political point of view, this matter is not OK.'

b. *That this matter is not OK is from a political point of view.

Nor does it predicate of the sentence without the adverb, the paraphrase in (65b) being impossible. If anything, it is related to the speaker; the political point of view is the standpoint he or she takes in making the assertion that the matter is not OK.

Speaker/hearer-oriented adverbs differ from predicate-related adverbs as well; what they predicate of is not part of the sentence in which they occur. The speaker-oriented adverb *laoshi shuo* 'honestly' predicates of the speaker in (66a), and of the hearer in the question in (66b), at whom it is directed:

(66)a. Zhejian shi laoshi shuo bu jiandan.
this matter honestly not simple
'This matter, honestly, is not simple.'

b. zhejian shi laoshi shuo jian-bu-jiandan?
this matter honestly JIAN-not-simple
'Honestly, is this matter simple?' (speaker/hearer-oriented)

In both cases, the adverb is not semantically related to anything in the sentence.

Domain adverbs differ from predicate-related adverbs with respect to inference. Thus, the sentence in (67a) does not entail that in (67b):

(67)a. Legally, this matter is very complicated $\not\rightarrow$
b. This matter is very complicated.

We thus have an independent means to justify that domain adverbs are not predicate-related.[13]

Inference holds for sentences with speaker-oriented adverbs, however; the sentence in (68a) entails that in (68b):

(68)a. Honestly, no one knows the answer to this question $\rightarrow$
b. No one knows the answer to this question.

The speaker of the sentence in (68a) expresses his or her attitude toward a proposition in (68b). It would be odd for the speaker to claim to be honest about a proposition and yet not committed to the proposition being true. This is the reason the sentence in (68b) can be inferred from that in (68a).

4.3. *Adverb Classes and Variable-binding in Yes/No Questions*

Given the independent semantic difference between the two classes of adverbs according as their semantic relations with the predicate or the proposition, it is natural to bring this difference to bear on their different syntactic distributions.

The configuration in (69) is generally excluded by the MBR if YP intervening between an A-bar moved XP and its trace is a potential A-bar binder (cf. section 3.4):

(69) … XP_i … YP … t_i …

As domain and speaker/hearer-oriented adverbs may appear in the position of YP but predicate-related adverbs may not, it must be that the latter are

potential A-bar binders, and the former are not. The question that arises is whether there is principled reason why the two different classes of adverbs should behave differently with respect to the MBR, that is, whether the difference is related to an independent difference between predicate-related adverbs and non-predicate-related adverbs.

I suggest that syntactic effects in a certain locality are in fact correlated with semantic relations. Specifically, elements in a certain syntactic domain may interact syntactically only if they have semantic relations in that domain. This syntax-semantic interface condition on variable-binding does not concern the relation between a *wh*-moved phrase and its own trace since it imposes a constraint on syntactic interactions among different elements within certain locality. Thus, a *wh*-moved phrase is an A-bar binder of its own trace but is a potential A-bar binder of other traces in some syntactic domain only if it and the antecedents of the other traces have semantic relations in that domain.

If this is correct, then it follows that predicate-related adverbs interact syntactically with the A-not-A operator, i.e., they may not intervene between the operator and its trace, since they have semantic relations in the domain under the scope of the operator. Domain and speaker/hearer-oriented adverbs do not interact syntactically with the A-not-A operator in the same domain, i.e., they are not potential A-bar binders of the trace of the A-not-A operator precisely because they have no semantic relations in that locality.

In the account of the distribution of adverbs in A-not-A questions in terms of variable-binding, it is crucial that the A-not-A operator move leaving behind a trace, giving rise to a configuration where an adverb may intervene between the two. It is thus of special interest that the intervention effects of predicate-related adverbs are entirely absent in yes/no questions with the question particle *ma*:

(70)a. ta luan pao ma? (manner)
he chaotically run Q
'Did he run all over the place?'

b. laoban yanli de zebei ta ma? (Agent-oriented)
boss sternly accuse him Q
'Did the boss sternly accuse him?'

If the question particle *ma* is in fact the overt realization of the abstract morpheme Qu base-generated in C that is covert in English (cf. Tang 1989, Cheng, Huang and Tang 1996), then the lack of the intervention effects of adverbs in *ma*-questions is understandable:

(71) LF: [$_{CP}$ [[$_{IP}$ ... [adverb [$_{VP}$ ... V ...]]]] *ma*]

In (71), the question particle *ma*, a head, apparently occurs in the highest head-position in the clause; it cannot possibly move to a still higher head-position and thereby leave behind a trace. The issue of adverb intervention therefore does not arise. The examples in (70) thus lend empirical support to A-not-A questions having a different analysis from that for *ma*-questions; specifically, an A-not-A operator moves leaving a trace, and the relation between the two is subject to the locality constraint on variable-binding.

4.4. *Temporal and Locative Adverbs*

As we have seen, temporal and locative adverbs may occur to the left of the A-not-A predicate (cf. the examples in (29a) and (29b)), just like the non-predicate-related domain and speaker/hearer-oriented adverbs. It is thus natural to consider the possibility that temporal and locative adverbs in fact are not related to the predicate, explaining why they may intervene between the A-not-A operator and its trace.

I suggest that this is indeed this case, and that temporal and locative adverbs are related to the independently motivated world and time coordinates of the formal interpretive model in the Montague tradition (Montague 1970).

4.4.1. *Interpretation of Temporal and Locative in Model-theoretic Semantics*

In model-theoretic semantics, the semantic value of a proposition is evaluated with respect to a formal interpretive model consisting of a set M of individuals, a world w, a time t and a value-assignment function g (cf. Dowty, Wall and Peters 1981: 131ff).

The relation between the time coordinate of the formal model and the reference time of the sentence is straightforward. If a sentence is evaluated to be true at the time coordinate t of the model, then the reference time of the proposition is equal to t. It is less obvious that the world coordinate w is related to the reference location of the sentence, especially when a locative adverb is absent. Nevertheless, it is possible to show that a sentence always contains a location that is related to w. To appreciate this point, consider the examples in (72):

(72)a. John sang in New York last Friday.
b. John sang.

The sentence in (72a) contains an explicit locative and temporal adverb. It is true in a formal interpretive model with the time coordinate t and

the world coordinate w, a possible state of affairs, just in case John sang in a location in w that is New York and at time t that is the preceding Friday. Obviously, if the proposition is true in the model, then the location the locative adverb refers to must be part of w. By contrast, the proposition in (72b) contains no explicit temporal or locative adverb. It is nonetheless understood to be true in a formal interpretive model just in case John sang in some location in w at time t prior to speech time. I assume that in this case there is an implicit location variable l in w that is bound by existential closure (Heim 1982). These two cases can more formally be represented as in (73):

(73)a. $||$John sang in New York last Friday $||^{M, w, t, g}$ = true iff
l = New York & $l \in w$
t = last Friday
$g(a)$ = John, where $a \in M$
$a \in \{x$: x is a singer in w at $t\}$

b. $||$John sang $||^{M, w, t, g}$ = true iff
$\exists l \in w$
$t <$ speech time
$g(a)$ = John, where $a \in M$
$a \in \{x$: x is a singer in l at $t\}$

There is thus a one-to-one interpretive relationship between the world and time coordinates of the formal interpretive model and the location and reference time of the sentence. The world and time coordinates of the model must be related to some (possibly implicit) locative and temporal adverb, and the location and the time (possibly implicit) of the sentence must be related to the world and time coordinates of the model. The relationship between the world/time coordinate and the (implicit or explicit) locative/temporal adverb is very strong. It seems to exist in every sentence,[14] most pronounced in comparison with instrumental and benefactive adverbs.

As is well-known, the instrumental and benefactive phrases are mostly optional and hence may be considered adverbs (cf. note 10):

(74)a. John broke the window (with a hammer).
b. John bought a book (for Mary).

Even when the instrumental or benefactive phrase is missing in (74), the sentences are still understood to contain an implicit one.

Nevertheless, the optionality of the locative/temporal adverb in (72) is not comparable with that of the instrumental or benefactive adverb in (74). It seems always possible for a location or temporal adverb to appear or be understood as implicit, but it is not so with a benefactive or instrumental adverb:

(75)a. It rained (in the south/*for the farmers).
b. The bomb exploded (at five/*with the remote control).

Even without an explicit locative or temporal adverb, the events expressed in (75) are understood to have taken place at some place at some time. But they cannot be understood to have an implicit benefactive or instrument adverb. This fact follows directly from the one-to-one interpretive relationship between the location and reference time of the sentence to the world and time coordinates of the formal interpretive model, and the lack thereof for benefactive or instrument adverbs.

As a result of their one-to-one relationship, locative and temporal adverbs displaced from their base-positions need not bind their traces for interpretation. The familiar ambiguity as in the examples in (76) is due to the extracted locative or temporal adjunct operator (left out here for simplicity) being related to the world and time coordinates of the formal interpretive model for either the matrix or embedded clause:

(76)a. [Zhangsan shuo [Lisi jisha]] de nei yi tian.
say commit suicide DE that day
'The day *x* when they said on *x* that Lisi committed suicide.'
OR
'The day *x* when they said that on *x* Lisi committed suicide.'

b. [Zhangsan gaosu Lisi [Wangwu gen Dingliu jianmian]]
tell with meet
de difang.
DE place
'The place *x* where Zhangsan told Lisi in *x* that Wangwu met Dingliu' OR
'The place *x* where Zhangsan told Lisi that in *x* Wangwu met Dingliu'

As each clause is interpreted by a formal interpretive model, multiple occurrences of locative and temporal adverbs with different spatial or temporal properties are possible, as long as they occur in different clauses:

(77) Tamen zuotian zai Beijing xuanbu Zhangsan mingtian
they yesterday in announce tomorrow
zai Shanghai yanjiang.
at lecture
'They announced in Beijing yesterday that Zhangsan will lecture in Shanghai tomorrow.'

No interpretive problem arises in (77), since each locative or temporal adverb is related to the world or time coordinate of the model for the clause in which it occurs.

The one-to-one interpretive relation with the world and time coordinates of the formal interpretive model has no bearing on syntactic movement, the representation of the positions vacated by movement, or the constraints on it.[15] Temporal and locative adverbs are like any other elements in being subject to general principles of grammar for movement and representations resulting from movement. Thus, if moved categories generally leave traces, and traces are constrained by grammatical principles like the ECP, then displaced temporal and locative adverbs will leave traces when they move, and their traces will also be subject to the same constraints. Temporal and locative adverbs therefore show the familiar properties of long-distance dependency.

Temporal and locative adverbs have some specific properties in certain syntactic contexts that other adverbs do not, e.g., island effects and narrow scope with respect to negation without c-command, giving the impression that they are somehow argument-like, in contrast with most other adverbs (Huang 1982, Rizzi 1990, Lasnik and Saito 1992). Work to date has not been able to provide an entirely satisfying explanation for their part-adjunct and part-argument status. This has a fairly straightforward explanation in the account that I suggest here. These adverbs are syntactically adjuncts, exhibiting the same ECP or CED effects as other adjuncts. As they bear a relation with the world and time coordinates of the formal interpretive model for the clause in which they appear, they need not bind a trace in the clause in order to be interpreted as modifying that clause. Other adverbs must bind their traces for semantic interpretation when they are displaced precisely because they have no relation with the formal interpretive model.

As it turns out, sentences with locative and temporal adverbs allow inference. From either the sentence in (78a) or that in (78b), we can infer the sentence in (78c):

(78)a. John sang in New York.
b. John sang last Friday.
c. John sang.

The inference in (78) is reminiscent of that found in sentences with predicate-related adverbs. But this does not necessarily mean that locative and temporal adverbs must be taken to be restricting functions like predicate-related adverbs. To the extent the inference follows from independently motivated assumptions, it is not necessary that locative and temporal adverbs be related to the predicate for inference to follow.

Indeed, it is easy to see that inference in sentences with locative and temporal adverbs follows from their relations with the world and time coordinates of the formal interpretive model. If the sentence in (78a) is true in a formal model with the world coordinate with a location equal to New York, then it follows, trivially, that there is a model in which the sentence in (78c) is true (in the latter case, the implicit location variable is existentially closed). Similarly, if the sentence in (78b) is true in a formal model with the time coordinate equal to last Friday, then it also follows that there is a model in which the sentence in (78c) is true with the time coordinate preceding speech time.

4.4.2. *Some Conceptual Issues with the World and Time Coordinates*

I suggest that temporal and locative adverbs have the syntactic property they do because they have a relationship with the world and time coordinates of the formal interpretive model. One can therefore legitimately ask, as an anonymous reviewer does, whether there is principled reason why the formal model does not have coordinates for other adverbs, e.g., manner and domain adverbs.

It is readily understandable that the formal model should have a time coordinate. Many languages, including English, have overt morphology for tense, and we need some way to interpret it. It is therefore natural that the formal model should have a time coordinate to interpret tense. It is less obvious why it should also contain a world coordinate for locations, especially when locative adverbs need not be present. The issue then becomes why the formal model has a coordinate specifically for locations but not one for manner or domain adverbs, given that they all need not be present.

Two sets of empirical facts appear to have some bearing on the issue. First, the optionality of locative adverbs is not comparable to that of other adverbs. Locative adverbs can be understood to be implicit in far more cases than other adverbs (cf. section 4.4.1). Thus, while it is easy to understand

that there is an implicit locative adverb in both (79a) and (79b), i.e., John cooked at some place and water freezes where the temperature is O° C:

(79)a. John cooked.
b. Water freezes at O° C.

it is fairly difficult to understand that an implicit manner or instrument adverb is present in (79b) just as it is in (79a). If the formal interpretive model contains a world coordinate for location, then it would reflect the fact that a sentence is always understood to contain a possibly implicit locative adverb (cf. the discussion of the example (72b) in (73b) and note 14).

Second, locatives seem special cross-linguistically. If a language has a separate category for prepositions, then locations and spatial relations, i.e., the relations among locations, can be expressed by prepositions. Remarkably, manner and many other adverbials may be expressed by a prepositional phrase headed by a locative preposition. For instance, English uses the same prepositions for locatives, e.g., *in*, *from* or *to*, for manner PPs (e.g., *carefully = in a careful way*), domain PPs (e.g., *politically = from the political point of view*) and degree PPs (e.g., *extensively = to a great extent*). A language may have very few prepositions, but if it has several, then locatives invariably outnumber non-locatives. Significantly, to my knowledge, it seems that every language that has prepositions uses some of them for locatives.

It remains to be explained why these two sets of empirical facts about locatives should be true; logically, the facts may very well be otherwise. To the extent that manner and other adverbs do not manifest themselves in as many ways as temporal and locative adverbs,[16] it is natural that the grammar should have some general mechanisms, e.g., the time and world coordinates of the formal interpretive model, for interpreting sentences as containing temporal and locative adverbs.

4.5. *An Apparent Problem: Scope of Adverbs and Negation*

Ernst (1994: 262, note 8) claims that the relative scope of *clearly* and *not* in English in (80) is a problem for the MBR account of scope:

(80)a. They clearly don't understand.
b. Clearly$_i$ not$_j$ [they t_i t_j understand]

He argues that if we adopt the widespread assumption that negation and (other) sentential adverbs must raise at LF to scope over the sentence, then the adverb *clearly* in (80a) must raise as well in order to scope over negation. But in the LF-representation in (80b), negation is the most local A-bar

binder for both traces, and the trace t_i of the adverb *clearly* is not bound by negation, violating the MBR.

If Ernst's argument stands, then the account for the non-occurrence of most core adjuncts in A-not-A questions, which crucially relies on the MBR, may need to be reconsidered. I argue that the scope fact in (80) is only an apparent problem.

Ernst's argument is undermined by two facts. First, negation need not raise, in fact, cannot raise in some cases, in order to have scope over the sentence. A conceivable motivation for raising of negation is to obtain a representation closely resembling formulas of predicate logic. The LF-representation in (81b) for the example in (81a) mirrors the logical formula in (81c):

(81)a. John is not tall.
b. LF: not$_i$ [John is t_i tall]
c. $\neg$(tall(John))

But if LF-raising is to be justified independently, then it must have the same property as that of raising elsewhere, for example, in syntax. In fact, much of the motivation for movement at LF is due to it being subject to the same constraints as those for overt movement (May 1977, Huang 1982).

Examples like those in (82)–(83) show that negation in positions inaccessible to movement can nevertheless have scope over the entire sentence:

(82)a. [no students] came to the party.
b. LF: no$_i$ [[t_i students] came to the party]
c. $\neg\ \exists x$, x a student, came(x)

(83)a. John saw [no students]
b. LF: : no$_i$ [John saw [t_i students]]
c. $\neg\ \exists x$, x a student, saw(x)(John)

There is no good reason to believe that negation in (82a) and (83a) raises at LF to yield the representations in (82b) and (83b). The ungrammaticality of the examples in (84)–(85) shows that such movement is impossible:

(84)a. *how tall/many$_i$ have [[t_i students] registered for the party]?
b. *how tall/many$_i$ has [John registered [t_i students] for the party]?

(85)a. *tall/three$_i$ [Bill said [[t_i students] have registered for the party]]
b. *tall/three$_i$ [Bill said [John has registered [t_i students] for the party]]

If negation cannot raise in (82a) and (83a), and yet has scope over the entire sentence, then it conceivably need not raise in (80a) and (81a) in order to

have sentential scope. With negation staying in its surface position in (80a), the trace of the adverb would bind its own trace. No violation of the MBR arises.

Second, the adverb *clearly* in (80a) is not a manner adverb modifying the predicate *understand* (cf. Jackendoff 1972), but is most likely an epistemic or evaluative subtype of speaker-oriented adverbs (Ernst 2002: 96). It is truth-conditionally equivalent to the sentence in (86a), not that in (86b):

(86)a. It is clear to the speaker that they don't understand.
b. They don't understand in a clear manner.

The intuition that the adverb *clearly* has wide scope over negation in (80a) is due to the adverb being a two-place predicate, what is clear and to whom it is clear, and negation is contained inside one of its arguments.

If negation does not raise, as Ernst (2002: 317) assumes for Chinese, then the example in (80a) is not a counterexample to the MBR. As an anonymous reviewer points out, a possible solution for scope of negation is to assume that negation comes in two projections (cf. Laka 1990, Zanuttini 1997), one in the CP area expressing the scope of negation and another is lower in the structure where the overt negation appears. The scope of negation can then be determined without anything moving. Wide scope of the adverb *clearly* over negation in (80a) would then be the result of the adverb being in a higher position than that of negation.

5. Conclusion

In this paper, I show that the base-position of an abstract Q feature for yes/no questions is relevant to the distribution of adverbs. In Chinese, Q is base-generated adjoined to the VP and subsequently moves to SpecCP, giving rise to an antecedent-trace relation that is subject to the same general constraint on variable binding. This situation does not arise in English since Q is base-generated in C.

I distinguish adverbs according to whether they are semantically related to the predicate, the arguments of the predicate, or the proposition and show that the distinction has some bearing on inference. I suggest that adverbs with such a relation show syntactic interactions with the A-not-A operator, i.e., being potential A-bar binders, and those without such a relation do not. Contrary to most common views, I claim that locative and temporal adverbs are not related to the predicate but to the world and time coordinates of the formal interpretive model. Thus, like other non-predicate-related adverbs, locative and temporal adverbs may intervene between

the A-not-A operator and its trace, these adverbs not being potential A-bar binders.

In not relying on movement of (non-interrogative) adverbs, even at LF, my account is in line with current theory of grammar according to which movement is possible only when it is required by checking of morphological features (Chomsky 1995). Non-interrogative adverbs do not obviously have morphological features that may check a matching feature elsewhere in the sentence.

My analysis sheds some light on the relation between syntax and semantics. Semantic relations have syntactic consequences in that certain syntactic interactions in a certain locality are possible only if they have some semantic relations in that locality. If this is correct, then it would be an interesting property of natural language.

Notes

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[1] Temporal adverbs generally cannot occur to the right of a thematic predicate; therefore, they cannot appear after its A-not-A form either:

(i)a.	Zhangsan	(mingtian)	lai	(*mingtian).
		tomorrow	come	tomorrow
	'Zhangsan is coming tomorrow.'			
b.	*Zhangsan	lai-bu-lai	mingtian.	
		come-not-come	tomorrow	

The occurrence of the temporal adverb to the right of the A-not-A form of the copula *shi* seems to suggest that the thematic vs. non-thematic distinction bears on the positioning of adverbs.

[2] As the A-not-A operator has no phonetic realization, it is difficult to tell empirically if the movement takes place overtly or covertly, or if there is movement at all. The movement of the operator may be conceptually motivated, though, if clauses need to be typed as declarative, interrogative or imperative (Cheng 1991).

What is specifically required for my analysis is a relation between the base-position of the A-not-A operator and SpecCP of a question. It would remain the same if the relation turns out

to be one involving no movement (cf. Tsai's (1994) base-generation analysis of in-situ *wh*-phrases).

[3] The classification of adverbs into different classes and the class labels for them are immaterial to our concerns here. As we will see, the distribution of particular adverbs crucially hinges on what they are semantically related to.

The formal details of the semantics of individual adverbs do not seem necessary for our discussion here. Ernst (2002) provides a meticulously articulate semantics for many classes of adjuncts but does not bring them to bear on A-not-A questions.

If adverbs actually sit in the spec of functional projections (Cinque 1999), then it is necessary to assume that the A-not-A operator may also adjoin to the projections of adverbs, in order to generate the surface forms of the structures in (16).

[4] Ernst (1994: 253–254) gives an account for the core adverb *daodi* 'after all' that expresses the speaker's strong emotion or impatience. It occurs in A-not-A questions but not in yes/no questions with the particle *ma*. The distribution of this adverb requires an additional assumption in Ernst's analysis as well as mine. For reason of space, I am not able to discuss it here (cf. Huang and Ochi 2004 and Law (in preparation) for a detailed discussion).

[5] The exact position of the trace, and the issue of whether its antecedent is an empty operator (Chomsky 1986b, Browning 1987) or the head of the relative clause (Vergnaud 1974, Kayne 1994) are irrelevant to our concerns here. What is crucial is that the ambiguity of the examples in (38a) and (39a) is represented by the different positions of the trace. The representation for the antecedent of the trace is omitted here for simplicity.

[6] As is well-known, the manner adverb *zenmeyang* 'how' may move out of syntactic islands (Lin 1992: 295). This adverb is obviously composed morphologically of *zenme* 'which' and *yang* 'way'. If *zenmeyang* is nominal, contra Tsai (1994: 135–136), while *zenme* is not, then their difference with respect to movement out of syntactic islands may be accounted for in terms of objectual vs. non-objectual distinction (Huang 1982).

[7] The assumption here seems to be that the argument in the *bei*-phrase c-commands the VP and all positions the VP dominates. This would follow, synchronically at least, if *bei* is a Case-marker. It is also an independent issue as to what the structural position of the *bei*-phrase is in (46). I will not resolve these issues here.

[8] For our purposes here, locality and binding can be defined as in (i):

(i) A is more local to B than to C iff A c-commands B and B c-commands C.
(ii) A binds B if A c-commands B and have the same index as that of B.

Assuming the indexing procedure is essentially free, the trace t_i of the subject in (50a) can in principle bear in index *j* and the MBR is not violated. Nevertheless, the result would be ruled out by a constraint on vacuous quantification (Chomsky 1986a), on a par with (iii) (cf. Aoun and Li 1993: 19):

(iii) *Who did John see Bill?

Ernst (1998: 124) argues that the MBR in (51) does not account for the scope interaction between subject and negation/modals. He suggests that the MBR be defined to include visibility of the intervening element. A category is visible if it is assigned Case under government. The suggested modification has no bearing on the facts considered here, Case-assignment being irrelevant to adverbs. My analysis is therefore compatible with Ernst's version of the MBR.

[9] An anonymous reviewer asks why the MBR is not violated in (i):

(i)a. Zhangsan weile butong de yuanyin dou xie-le sheme?
Zhangsan for different DE reason all wrote what
'What did Zhangsan write for different reasons?'

b. Who sloppily wrapped every present?

If the *wh*-phrase *sheme* 'what' and the quantifier *every present* raise at LF to a position to the left of the adverb, then the adverb would intervene between the raised category and its trace, apparently violating the MBR.

The point is well-taken. However, the problem is more general; it arises in cases of overt *wh*-movement as well:

(ii)a. What$_i$ did John usually read t_i?
b. Who$_i$ did they often say t_i had visited Bill?

In fact, examples of the sort in (ii) are problems for any variant of RM.

These cases are not entirely comparable to A-not-A questions, however. The traces in (i) and (ii) are in argument position, whereas the trace of the A-not-A operator is in adjunct position. One way to account for the lack of intervention effects in (i) and (ii) is to assume that an intervening category may bind a trace of type X (X is either A or A-bar) only if its original trace is of the same type X. As adverbs originate in A-bar positions, their traces are in A-bar positions. There is then no reason for supposing that they can ever bind a trace in A-position. The reviewer's example in (iii) is more relevant to the MBR:

(iii) How did they (so) suddenly appear there?

If the adverb *how* originates in a position after *suddenly* where (non-interrogative) manner adverbs occur, then the problem that arises is why the intervention of the adverb *suddenly* does not induce a violation of the MBR.

I am not able to give a full account for the lack of intervention effects in (iii), but a couple of points come to mind that may bear on the ultimate explanation for it. First, it is not obvious that the interrogative adverb *how* originates in the same position as that of (non-interrogative) manner adverbs, in-situ *how* being impossible in English (Lasnik and Saito 1991) (the multiple *wh*-phrases in (ivb) is to force an in-situ *wh*-phrase):

(iv)a. Who has quickly answered the question?
b. *Who has how (quickly) answered the question?

Second, *how* in English is not always an interrogative adverb. It can be used in exclamatives with no interrogative interpretation:

(v)a. John was under a lot of pressure lately. How stressful!
b. How beautiful she is in that dress!

Suppose *how* is inherently unspecified for the [WH] feature and is interpreted as an interrogative adverb just when it occurs in SpecCP of a C with a [+Q] feature. As there is no [+Q] feature in the exclamative (note the lack of subject-aux inversion typical of questions in (vb)), *how* is not interpreted as an interrogative adverb. If this is correct, then there is no semantic motivation for assuming that the interrogative *how* is interpreted in the position of the (non-interrogative) manner adverbs. The example in (iii) no longer poses a problem for the MBR.

If *how* is indeed base-generated in a [+Q] SpecCP, then the trace it leaves behind when it undergoes movement would serve as a signpost for the clause in which it originates. Ambiguity in cases of long-distance movement is due to it possibly being in different SpecCPs. There remains the issue of why Chinese should differ from English in allowing *zenme* 'how' to occur in the same position as non-interrogative manner adverbs (cf. section 4.1).

[10] In comparable structures to those in (52)–(53) Aoun and Li (1993: 26) represent the VP as VP1 and V′ as VP2. Whether the V′ vs. VP difference is simply notational or of theoretical substance needs to be resolved independently. The object quantifier must be allowed to adjoin to a position asymmetrically c-commanded by the subject quantifier for the subject wide-scope reading.

[11] Goal and Source phrases are most likely complements rather than adjuncts:

(i)a. tamen dao xuexia qu. (Goal)
they to school go
'They are going to school.'

b. women cong zher qu. (Source)
we from here go
'We are going from here.'

Sentences with predicates like *qu* 'go' are mostly understood to have a Goal and a Source phrase, even when they are absent (cf. the optionality of temporal, locative, instrumental and benefactive adverbs discussed in section 4.4.1 and note 14).

Goal and Source phrases do not occur to the left of the A-not-A predicate, just like preverbal *ba*-phrase:

(ii)a. *tamen dao xuexiao qu-bu-qu?
they to school go-not-go
'Are they going to school?'

b. *women cong zher qu-bu-qu?
we from here go-not-go
'Are we going from here?'

(iii)a. Lisi you-mei-you ba huaping dapuo le?
have-not-have vase break Perf
'Did Lisi break the vase?'

b. *Lisi ba huaping you-mei-you dapuo le?
vase have-not-have break Perf
'Did Lisi break the vase?'

From the perspective of the analysis in section 4.3, it must be that preverbal complements (Goal, Source and *ba*-phrases) are in adjunct position.

[12] The cardinality of the set of propositions the adverb *often* maps to is contextually determined, depending on what counts as often.

[13] Despite our informal intuition, there is no reason to suppose that domain adverbs (formally) restrict the domain of the predicate, contrary to what Ernst (2004) seems to suggest:

(i)a. Linguistically, these examples are interesting.
b. These examples are interesting.

Entailment fails to hold from (ia) to (ib), in sharp contrast with the restricting functions of most predicate-related adverbs (cf. the discussion of the examples in (63)).

[14] An anonymous reviewer asks where the location is in examples like *truth is relative* and *this word has no lexical meaning*. These are clearly generic sentences of a sort, true or false regardless of locations. I assume that in these cases the location variable *l* in *w* is bound by a universal quantifier, very much on a par with the non-generic example in (73b) where *l* is bound by existential closure.

[15] An anonymous reviewer argues that the example in (i) with two temporal expressions is a counterexample of my claim in the text that the relation between location and time of a sentence and the world and time coordinates of the formal interpretive model is one-to-one:

(i)a. On Saturday she arrived at 3 PM.
b. In Bolivia they shear sheep in front of the churches.

When we consider the relation between the two temporal adverbs or between the two locative adverbs, it becomes clear that they express only one unique time or location. The time expressed in (ia) is just one, i.e., 3 PM of the Saturday, and the location in (ib) is just the space occupied by the churches in Bolivia. The relation between the temporal and locative adverbs and the time and world coordinates is thus one-to-one.

[16] An anonymous reviewer raises the question as to why locative adverbs should not be considered as being related to predicates (cf. Davidson 1967, Parsons 1990). The point is well-taken, but the issue is an empirical one, i.e., what facts such an analysis of locatives can explain.

While my proposal brings together several facets of the grammar (model-theoretic semantics, the constraint on variable-binding and the distributions of adverbs in A-not-A questions), it remains to be seen if the Davidsonian analysis of locatives cover the same empirical grounds. If one is to adopt model-theoretic semantics, then it follows as a consequence that locatives are related to the world coordinate of the formal interpretive model; otherwise, the world coordinate would serve no purposes.

The reviewer draws my attention to Maienborn's (2001) work according to which there are three different kinds of locatives, the internal modifiers base-generated at the V-periphery, the external modifiers at the VP-periphery, and the frame-setting modifiers at the left-periphery of TopP (i.e., within the C-domain):

(i)a.	Eva signed the contract in Argentina.	(external locative)
b.	Eva signed the contract on the last page.	(internal locative)
c.	In Argentina, Eva still is very popular.	(frame-setting locative)

In this analysis, the external modifiers are related to the verb's eventuality argument, most probably the same as what is here called the Event argument, while the internal and frame-setting modifiers are underspecified, being linked up to a referent that is related to, respectively, the verb's eventuality argument and the topic of the sentence (Maienborn 2001: 198). Semantically, external and internal modifiers allow inference, but frame-setting modifiers do not. One can infer that Eva signed the contract from (ia) and (ib), but from (ic), one cannot infer (ii):

(ii) Eva still is very popular.

Space limitation does not allow me to do full justice to this work here, but a couple of remarks most relevant to the issue of what these locatives are related to are in order. First, if the external locative is related to the world coordinate, then the inference follows, as discussed in the text (cf. the examples in (78)). Second, the failure of inference from (ic) to (ii) is largely due to the predicate is *popular* being vague and subjective. Without a context, (ii) may mean that Eva still is very popular in some geographical area, or that she still is very popular with a certain sector of the world population, e.g., with the tabloid press. In a discourse about celebrities in Argentina and the issue under discussion is whether they are well-liked by the general population, then the sentence in (ii) may very well be understood that Eva is popular in Argentina. In this case, the implicit location in the world coordinate is equal to Argentina; the inference then follows.

Third, as for the internal locative, it is not inconceivable that it semantically forms a complex predicate with the verb. Along these lines, *on the last page* in (ib) forms a complex predicate with *sign*, and the whole complex predicate *sign on the last page* takes *the contract* as argument. On this view, then, *on the last page* is not an adjunct and hence is not related to the world coordinate of the formal interpretive model. For the sentence in (ib), then, the world coordinate would be bound by existential closure (cf. note 14) (cf. note that (ib) may have an explicit locative like *at the meeting*). There arises, however, the issue of the mapping between syntax and semantics, for *on the last page* does not form a syntactic constituent with the verb *sign*.

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Zentrum für Allgemeine Sprachwissenschaft
Jägerstr. 10-11, 10117 Berlin, Germany
E-mail: law@zas.gwz-berlin.de