



**Akira Ota**  
at Senshun'en Garden on Feb. 11, 1997  
(Photograph by Yukio Nagahara)

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# STUDIES IN ENGLISH LINGUISTICS

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A Festschrift for Akira Ota  
on the Occasion of His Eightieth Birthday

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## SOME NOTES ON ARGUMENT STRUCTURE IN NOUN PHRASES

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### 1. Introduction

In this paper, we will investigate the argument structure in noun phrases and sentences with special reference to the temporal *then/when*, and the locative *there/where*.

It was pointed out by Huang (1982) that the Wh-phrases *when* and *where* pattern with argument Wh-phrases, and not with adjunct Wh-phrases, in sentences. As shown in (1)-(2), an object Wh-phrase can appear in situ in multiple-Wh questions, but an adjunct Wh-phrase cannot.

- (1) a.  $\text{who}_i t_i$  bought what
- b.  $\text{who}_i t_i$  gave the book to whom
- (2) a. \* $\text{who}_i t_i$  bought the book why
- b. \* $\text{who}_i t_i$  fixed the car how

The examples in (3) show that *when* and *where*, in clear distinction with *why* and *how*, are allowed in this context.

- (3) a.  $\text{who}_i t_i$  bought the book when
- b.  $\text{who}_i t_i$  bought the book where

On the other hand, it is noted in Murasugi (1991), and Murasugi and Saito (1993) that *when* and *where* behave as adjuncts in noun phrases. Some of the relevant examples are given in (4).

- (4) a. \* $\text{who}_i t_i$  remembered [<sub>NP</sub>the TV show when]
- b. \* $\text{who}_i t_i$  read [<sub>NP</sub>the books where]

The purpose of this paper is to examine the contrast between (3) and (4) in detail, and to discuss its implication for the theory of argument structure.

In the following section, we will first briefly go over the discussion of (3) and (4) in Murasugi (1991), and Murasugi and Saito (1993). One purpose for this is to establish one of our main assumptions, i.e., the asymmetry observed in (1)-(2) above is in fact an argument-adjunct asymmetry, as proposed by Huang (1982). Then, in Section 3, we will consider the contrast between (3a) and (4a) in more detail. Discussing the behavior of *when* within a noun phrase headed by a theta-role assigning noun, as in (5), we will argue that the Wh, generally, can be an argument in sentences but not in noun phrases.

- (5) \* $\text{who}_i t_i$  criticized [<sub>NP</sub>the shooting of rabbits when]

We will then show that this difference between sentences and noun phrases is expected under Grimshaw's (1990) theory of argument structure, and hence, provides support for it.

In Section 4, we will examine the contrast between (3b) and (4b) with respect

to *where*. Based on examples like (6), we will argue that this contrast should not be attributed to the difference between sentences and noun phrases (or verbs and nouns), but instead to whether the relevant predicate is theta-role assigning or not.

- (6)  $\text{who}_i t_i$  criticized [<sub>NP</sub>the shooting of rabbits *where*]

We will conclude that *when* is associated with lexical categories such as V and N, but *where* can be an argument of the event predicate. We will speculate on why this difference between *when* and *where* should exist.

## 2. Quasi-Adjuncts as Sentential Arguments

We will show in this section that the grammaticality of (3a-b), repeated below as (7a-b), is due to the argumenthood of *when* and *where* in these examples, as proposed by Huang (1982).

- (7) a.  $\text{who}_i t_i$  bought the book when  
b.  $\text{who}_i t_i$  bought the book where

We will first discuss Huang's own analysis based on his empty P hypothesis, and an alternative proposed in Aoun (1986), which attributes the grammaticality of (7a-b) to the "referentiality" of *when* and *where*.<sup>1</sup> Then, we will go over the arguments in Murasugi (1991), and Murasugi and Saito (1993). It is argued there that examples like (4a-b), repeated below as (8a-b), show that Huang's empty P hypothesis must be rejected, but also that his main idea to attribute the grammaticality of (7a-b) to the argumenthood of *when* and *where* must be correct.

- (8) a. \* $\text{who}_i t_i$  remembered [<sub>NP</sub>the TV show *when*]  
b. \* $\text{who}_i t_i$  read [<sub>NP</sub>the books *where*]

### 2.1. Argumenthood vs. Referentiality

As noted in the introduction, there is a clear contrast between object Wh-phrases and adjunct Wh-phrases: the former can appear in situ but the latter cannot. The relevant examples, (1)-(2), are repeated below as (9)-(10).

- (9) a.  $\text{who}_i t_i$  bought what  
b.  $\text{who}_i t_i$  gave the book to whom  
(10) a. \* $\text{who}_i t_i$  bought the book why  
b. \* $\text{who}_i t_i$  fixed the car how

Huang (1982) discusses this contrast in detail, and provides an explanation in terms of the ECP. The fundamental assumption in his explanation is that this contrast should be considered a case of an argument-adjunct asymmetry.

Huang also notes that *when* and *where* pattern with arguments, as illustrated in (7). If temporal and locative phrases should be considered adjuncts, as Huang assumes, this fact is quite mysterious. In order to solve this problem, Huang (1982) suggests first that *when/where*, as opposed to *why/how*, are NPs.<sup>2</sup> This seems reasonable since the former can appear as complements to P, but not the latter, as shown in (11).

- (11) a. since when  
b. from where  
c. \*for why

- d. \*by how

Then, he suggests that the structure of (7b), for example, is as in (12a).

- (12) a.  $\text{who}_i t_i$  bought the book [<sub>PP</sub> [<sub>PE</sub>] [<sub>NP</sub>where]]  
b.  $\text{who}_i t_i$  bought the book [<sub>PP</sub> (<sub>AdvP</sub>) why]

In (12a), the locative PP headed by the empty P is an adjunct. But the NP *where* is the object of the empty P, and hence, is an argument. We thus expect it to pattern with the object Wh-phrases in (9). On the other hand, given that *why* is itself a PP (or an AdvP), there is no position for an empty P in (12b). Thus, the empty P analysis does not generalize to this case, and we correctly predict (10a) to be ungrammatical.

Huang's (1982) empty P analysis is quite attractive, because according to this analysis, the examples in (7) are analyzed exactly as those in (13).

- (13) a.  $\text{who}_i t_i$  bought the book for what reason  
b.  $\text{who}_i t_i$  solved the problem by which method

In (13), *what reason* and *which method* are objects of P, and hence, are arguments in the same way that *where* in (12a) is.

An interesting alternative to Huang's (1982) analysis, however, is suggested in Aoun (1986). Aoun proposes that the contrast in (9)-(10) is not an argument-adjunct asymmetry, but should be attributed to the difference in the inherent nature of the Wh-phrases. More specifically, he suggests that *what/whom* are "referential," but *why/how* are not. Then, only "referential" Wh-phrases can appear in situ. Given this characterization, the examples in (10) imply that *when/where* are "referential." As evidence for this, Aoun appeals to Huang's observation that these Wh-phrases have the distribution of an NP, as shown in (11), and in addition, to the fact that they, in contrast with *why/how*, have non-Wh pronominal forms, *then/there*. Aoun, based on this "referential" vs. "non-referential" distinction, presents an account for (7), as well as (9)-(10), in terms of his generalized binding theory.<sup>3</sup> A similar intuition is pursued in a different way in Cinque (1990) and Rizzi (1990).

### 2.2. When/Where in Noun Phrases

An argument against Huang's (1982) empty P hypothesis is presented in Murasugi (1991), and Murasugi and Saito (1993). The crucial evidence involves *when* and *where* within NPs. Before we consider *when/where* in situ, let us first discuss overt extraction out of NPs.

A contrast between object and adjunct Wh-phrases, similar to the one in (9)-(10), is observed when they are moved overtly across a barrier. Thus, (14b) is worse than (14a).

- (14) a. ?\*which car<sub>i</sub> did Mary become angry [because John fixed  $t_i$ ]  
b. \*how<sub>i</sub> did Mary become angry [because John fixed the car  $t_i$ ]

Huang (1982) attributes the status of (14a) to his CED, which was later incorporated into Subadjacency by Chomsky (1986), and the stronger deviance of (14b) to the ECP. The same kind of contrast is found with extraction out of NPs, as shown in (15).

- (15) a.  $\text{who}_i$  did you see [a picture of  $t_i$ ]  
b. ?\* $\text{who}_i$  did you destroy [a book about  $t_i$ ]

c. \*about whom<sub>i</sub> did you destroy [a book *t<sub>i</sub>*]  
 (15a-b) are discussed in Chomsky (1977). The latter is worse than the former, since the PP headed by *about* is an adjunct. The Wh-movement, thus, involves extraction out of an adjunct, as in (14a), and hence, violates the CED. In (15c), the adjunct PP is itself moved out of the NP. This example, like (14b), has the status of an ECP violation.

Stowell (1989) discusses examples similar to (15c), and presents an explicit ECP analysis. Some of his examples are shown in (16).

- (16) a. who<sub>i</sub> did you sell [a picture of *t<sub>i</sub>*]  
 b. ??who<sub>i</sub> did you sell [Mary's picture of *t<sub>i</sub>*]  
 c. \*by whom<sub>i</sub> did Frank sell [a picture *t<sub>i</sub>*]  
 d. \*\*why<sub>i</sub> does Jane regret [Bob's dismissal of her *t<sub>i</sub>*]

Stowell's account is based on the DP hypothesis. More specifically, he assumes that the NP within a DP is not L-marked, and consequently, it not only constitutes a barrier itself but also makes the dominating DP a barrier by inheritance. The movement of *who* in (16a) can proceed through the DP Spec, as illustrated in (17).

- (17) who<sub>i</sub> ... [DP *t<sub>i</sub>*' [D'a [NP picture of *t<sub>i</sub>*]]]

If Subacency effects obtain when two or more barriers are crossed, the grammaticality of the example is correctly predicted. On the other hand, the movement of *who* in (16b) cannot use the DP SPEC position, as the position is occupied by *Mary's*. Hence, the movement crosses two barriers, i.e., NP and DP, and is ruled out by Subacency.

The examples in (16c-d) involve movement of adjuncts. As noted above, movement of an adjunct across a barrier results in strong deviance, which is explained by the ECP. And this is exactly what happens in these examples. The case of (16c) is illustrated in (18).

- (18) by whom<sub>i</sub> ... [DP (*t<sub>i</sub>*') [D'a [NP picture *t<sub>i</sub>*]]]

As the NP within the DP is a barrier, the movement violates the ECP regardless of whether the Wh-phrase moves through the DP Spec. This account for (16c-d) generalizes to (15c), and also to (19b) below.

- (19) a. ?\*which basket<sub>i</sub> do you like [the food in *t<sub>i</sub>*]  
 b. \*in which basket<sub>i</sub> do you like [the food *t<sub>i</sub>*]

The movement of the argument Wh-phrase *which basket* in (19a) violates the CED (Subacency), since the PP headed by *in* is an adjunct. (19b), on the other hand, is an ECP violation as an adjunct Wh-phrase *in which basket* is moved out of an NP, exactly as in (16c).<sup>4</sup>

Let us now return to Huang's (1982) empty P hypothesis with this background. One of the crucial examples against this hypothesis is shown in (20).

- (20) \*where<sub>i</sub> do you like [the food *t<sub>i</sub>*]

This example, in which *where* is extracted out of an NP, has the status of (19b), and hence, should be considered an ECP violation. But if we assume Huang's empty P analysis, the structure of this example can be as in (21).

- (21) where<sub>i</sub> do you like [the food [PP [*pe*] *t<sub>i</sub>*]]

Then, there should be no ECP violation since *where* is an argument Wh-phrase originating in the complement position of the empty P. We do predict that the

example violates the CED (Subacency): the PP headed by the empty P is an adjunct. But as noted above, the example has the status of (19b), not of (19a). (20), thus, constitutes evidence against the empty P hypothesis.<sup>5</sup>

The same kind of argument against the empty P hypothesis can be constructed on the basis of examples with Wh-phrases in situ. Let us consider the examples in (22).

- (22) a. who<sub>i</sub> *t<sub>i</sub>* read [the books on which shelf]  
 b. \*who<sub>i</sub> *t<sub>i</sub>* read [the books where]  
     cf. who<sub>i</sub> *t<sub>i</sub>* read [the books there]  
 c. \*who<sub>i</sub> *t<sub>i</sub>* remembered [the TV show when]  
     cf. who<sub>i</sub> *t<sub>i</sub>* remembered [the TV show then]

In (22a), the Wh-phrase *which shelf* is the complement of the P *on*. Hence it is grammatical exactly as the examples in (9) and (13), repeated in (23)-(24).

- (23) a. who<sub>i</sub> *t<sub>i</sub>* bought what  
       b. who<sub>i</sub> *t<sub>i</sub>* gave the book to whom  
 (24) a. who<sub>i</sub> *t<sub>i</sub>* bought the book for what reason  
       b. who<sub>i</sub> *t<sub>i</sub>* solved the problem by which method

(22b) and (22c), however, are ungrammatical. Given the empty P hypothesis, this is quite surprising, since (22b), for example, should be able to have the structure in (25).

- (25) who<sub>i</sub> *t<sub>i</sub>* read [the books [PP [*pe*] where]]

Here, the Wh-phrase *where* is the complement to the empty P, and hence, is an argument. Then, (22b) should be grammatical in exactly the same way as (22a). Similarly, (22c) should also be perfect with the structure in (26).

- (26) who<sub>i</sub> *t<sub>i</sub>* remembered [the TV show [PP [*pe*] when]]

Thus, (22b-c), like (20), pose a serious problem for the empty P hypothesis.

We saw above that examples like (22b-c) indicate that (7a-b), repeated below as (27a-b), should not be analyzed in terms of an empty P.

- (27) a. who<sub>i</sub> *t<sub>i</sub>* bought the book when  
       b. who<sub>i</sub> *t<sub>i</sub>* bought the book where

But at the same time, these examples provide strong support for Huang's (1982) basic approach to treat the contrast between (9) and (10), repeated below as (28) and (29), as an argument-adjunct asymmetry.

- (28) a. who<sub>i</sub> *t<sub>i</sub>* bought what  
       b. who<sub>i</sub> *t<sub>i</sub>* gave the book to whom  
 (29) a. \*who<sub>i</sub> *t<sub>i</sub>* bought the book why  
       b. \*who<sub>i</sub> *t<sub>i</sub>* fixed the car how

Recall that Aoun's (1986) alternative appeals to the difference in the intrinsic nature of the Wh-phrases: *what* and *whom* in (28) are "referential," but *why* and *how* in (29) are not. Then, the grammaticality of (27a-b) implies that *when* and *where*, like *what* and *whom*, are "referential." If this is the case, it is not clear at all why these Wh-phrases cannot appear in situ in (22b-c).

Huang's approach, on the other hand, attributes the contrast in (28)-(29) to the position of the Wh-phrase in situ: *what* and *whom* in (28) are arguments, while *why* and *how* in (29) are adjuncts. Thus, the data in (22b-c) and (27a-b) are consistent with this approach. The approach simply implies that *when/where* in (22b-

c) are adjuncts, and those in (27a-b) are arguments. It is thus concluded in Murasugi and Saito (1993) that examples like (22b-c) pose problems for Huang's empty P analysis, but provides strong support for his basic approach. In what follows, we will assume that the contrast between (27a-b) and (22b-c) is indeed an instance of an argument-adjunct asymmetry, and examine this contrast in more detail.

### 3. Temporal Phrases in Noun Phrases

Let us consider again the examples in (27a-b) and (22b-c), repeated below as (30a-b) and (31b-a).

- (30) a.  $\text{who}_i t_i$  bought the book when  
 b.  $\text{who}_i t_i$  bought the book where  
 (31) a. \* $\text{who}_i t_i$  remembered [the TV show when]  
 b. \* $\text{who}_i t_i$  read [the books where]

Given these examples, it was concluded in Murasugi (1991), and Murasugi and Saito (1993) that *when/where* can be arguments of V or I, but not of N. But these examples by themselves do not show that the asymmetry in (30)-(31) is an S-NP (or Verb-Noun) asymmetry. It seems quite plausible that *when/where* can be arguments only of a theta-role assigning (argument-taking) lexical head regardless of whether it is a V or an N. Then, *when/where* in (31) cannot be arguments not because they are within an N-projection, but because the head N is not theta-role assigning.

In this section, we will first investigate the distribution of *when* in more detail, and show that there is indeed an S-NP (or verb-noun) asymmetry. Then, we will argue that this asymmetry can be analyzed naturally under Grimshaw's (1990) theory of argument structure, and hence, provides support for it.

#### 3.1. A Sentence-Noun Phrase Asymmetry

We mentioned the possibility above that *when* can be an argument only of a theta-role assigning lexical head, i.e., a lexical head with an argument structure. If this is correct, then *when* in (31a) cannot be an argument because *TV show* is not a theta-role assigner. And a clear prediction is that *when* can be an argument even within an NP if the head N is a theta-role assigning noun. But as we will see below, this prediction is not borne out.

Since Chomsky (1970), the common syntactic properties between Ss and NPs have been widely known. In particular, there are nouns that take arguments exactly like verbs, as the famous pair in (32) illustrates.

- (32) a. the enemy destroyed the city  
 b. the enemy's destruction of the city

A recent, detailed discussion on those nouns is found in Grimshaw (1990).

As she notes, although those nouns, unlike verbs, need not have subjects, they must have their internal arguments syntactically represented. These properties can be observed in (33)-(34).

- (33) a. \*(there) destroyed a city  
 b. the destruction of the city

- (34) a. \*the professor examined  
 b. the professor's examination  
 c. the professor's examination of the paper

The examples in (33) show that the subject is optional with argument taking nouns. Those in (34), on the other hand, show that the object is obligatory. The head noun *examination* in (34b) cannot have the process reading, and is good only in the context as in (35).

- (35) the professor's examination is on the table

(34b) is in fact out if the subject is interpreted as the agent. In Grimshaw's terms, *examination* in this example can be interpreted only as a result nominal or a "single event nominal." *Examination* in (34c), on the other hand, can have the process reading. In Grimshaw's terms, it can be interpreted as a "complex event nominal." Only these nominals are argument-taking, and they, like verbs, must have their internal arguments represented syntactically.

Let us now return to the distribution of *when*, and examine if it can appear in situ within an NP headed by an argument-taking noun. A relevant example is shown in (36).

- (36) \* $\text{who}_i t_i$  remembered [the destruction of the city when]

This example contains an argument-taking noun, *destruction*, and shows clearly that *when* is not allowed in an NP even with an argument-taking noun. The following examples with gerundive nominals, which are considered typical argument-taking nouns in Lebeaux (1986), confirm this observation.

- (37) a. \* $\text{who}_i t_i$  remembered [the destroying of the city when]  
 b. \* $\text{who}_i t_i$  criticized [the shooting of rabbits when]  
 c. \* $\text{who}_i t_i$  witnessed [the falling of the big trees when]

It is clear at this point that we must reject our initial hypothesis on (30a) and (31a) that *when* can be an argument only of a theta-role assigning head. What we have is a genuine S-NP (or verb-noun) asymmetry. *When* is allowed in situ in Ss, but not in NPs. Given Huang's (1982) argument-adjunct asymmetry approach to Wh-phrases in situ, this implies that *when* can be an argument in Ss, but not in NPs even when the head N is argument-taking. In the following subsection, we will see that this contrast is expected under Grimshaw's (1990) theory of argument structure.

#### 3.2. Theta-Role Assignment in Noun Phrases

Before we start applying Grimshaw's theory to *when* within NPs, let us briefly discuss the categorial status of this Wh-phrase. As noted above in Section 2.1, Huang (1982) argues that *when* and *where* are NPs on the ground that they can appear as the objects of P. His argument generalizes to *then* and *there* as shown in (38).

- (38) a. since when / since then  
 b. from where / from there

This evidence is certainly suggestive.

On the other hand, we argued in Murasugi (1991) that *when/then* and *where/there* may be PPs. First, there are some limited cases where PP occur as the object of P, as in (39).



(39) the phrase moves from within the NP

So, the evidence in (38) is not decisive. Secondly, there is a context where *when/then* and *where/there* pattern with PPs rather than NPs. As shown in (40), an NP, but not a PP, can appear in the subject position of an NP.

- (40) a. that professor's lecture  
 b. \*on that day's lecture  
     cf. the lecture on that day  
 c. \*in that room's lecture  
     cf. the lecture in that room

And *then* and *there*, like the PPs in (40b-c), are not allowed in this position.<sup>6</sup>

- (41) a. \*then's lecture  
     cf. the lecture then  
 b. \*there's lecture  
     cf. the lecture there

The same is true of *when* and *where*, as shown in (42b-c).

- (42) a. who<sub>i</sub> t<sub>i</sub> remembers whose lectures  
 b. \*who<sub>i</sub> t<sub>i</sub> remembers when's lectures  
 c. \*who<sub>i</sub> t<sub>i</sub> remembers where's lectures

Thus, we concluded that *when/then* and *where/there* have the distribution of PPs, and hence, they may in fact be PPs.

But it is no longer clear to us that the data in (41)-(42) are relevant to the issue in hand. As illustrated in (43), not only *then* and *there*, but deictic pronouns in general cannot occur in genitive.

- (43) a. \*this's cover  
 b. \*that's back

Here, it is clear that *this* and *that* in (43) are not PPs but NPs. Thus, whatever principle that is responsible for (43) should rule out (41a-b), even if *then* and *there* are NPs. In the absence of any evidence to the contrary, we will adopt Huang's suggestive evidence in (38), and assume in this paper that *when/then* and *where/there* are NPs.

Once it is assumed that *when* is an NP, Grimshaw's (1990) theory becomes relevant for the analysis of examples like (37c), repeated below as (44).

- (44) \*who<sub>i</sub> t<sub>i</sub> witnessed [the falling of the big trees when]

As discussed above, she assumes that certain nouns are argument-taking, exactly like verbs. But she also argues that there is one important difference between argument-taking nouns and verbs. It is standardly assumed that nouns as well as verbs can assign theta-roles to their NP/PP/CP complements as in (45).

- (45) a. V/N NP  
 b. V/N PP  
 c. V/N CP

In particular, it is assumed that nouns can take NP arguments exactly like verbs. Chomsky (1981) and Stowell (1981), for example, argue that the *of* in (46b) is required only to assign Case to *the city*, and is inserted at S-structure. That is, at D-structure, the N *destruction* can assign the object theta-role to *the city* without *of*.

- (46) a. the enemy destroyed the city

b. the enemy's destruction of the city

However, Grimshaw (1990) argues, along the lines of Emonds (1985), that nouns are incapable of assigning theta-roles by themselves. That is, a noun can assign a theta-role only compositionally with a preposition. In (46b), then, *destruction* cannot assign a theta-role to *the city* without *of*. If D-structure is assumed, this implies that the *of* in (46b) must be presented at that level. And more importantly for our purpose, Grimshaw's theory implies that nouns can take only PP arguments. This is so since they cannot assign theta-roles without the aid of prepositions. Thus, only the configuration in (45b) is allowed for argument-taking nouns.

Let us now return to the contrast between (30a) and (44). The examples are shown in (47).

- (47) a. who<sub>i</sub> t<sub>i</sub> bought the book when  
 b. \*who<sub>i</sub> t<sub>i</sub> witnessed [the falling of the big trees when]

(47a) indicates that *when* can be an argument of a verb. The question was why it cannot be an argument of a noun, as (47b) shows. But this difference between verbs and nouns directly follows from Grimshaw's theory if *when* is an NP. As verbs can take NP arguments, there is no problem for *when* being an argument of a verb. On the other hand, nouns can only take PP arguments. Hence, *when* in (47b), being an NP, cannot be an argument of the noun *falling*. Consequently, the temporal Wh-phrase must be interpreted as an adjunct in this example.<sup>7</sup> The example is then ruled out exactly as (29a-b), repeated below as (48a-b).

- (48) a. \*who<sub>i</sub> t<sub>i</sub> bought the book why  
 b. \*who<sub>i</sub> t<sub>i</sub> fixed the car how

The explanation for (47b) is consistent with the fact that the example becomes grammatical when *of* is placed before *when* as in (49).<sup>8</sup>

- (49) who<sub>i</sub> t<sub>i</sub> witnessed [the falling of the big trees of when]

In fact, all of the relevant examples improve with *of*, as shown in (50).

- (50) a. who<sub>i</sub> t<sub>i</sub> remembered [the destruction of the city of when]  
 b. who<sub>i</sub> t<sub>i</sub> criticized [the shooting of rabbits of when]

In (49), possibly, the PP *of when* can be an argument of *falling*: *falling* and *of* compositionally assign a theta-role to *when*. Then, *when* itself is an argument. Or more plausibly, *of* mediates the assignment of the theme role, but not of the temporal role, and in (49), *of when* is interpreted as an adjunct. As shown in (51), a PP headed by *of* quite generally can be an adjunct.

- (51) a man of talent

Then, *when* in (49) is a complement within an adjunct PP, and is itself an argument exactly like *what reason* in (13a), repeated below as (52).

- (52) who<sub>i</sub> t<sub>i</sub> bought the book for what reason

In either case, the grammaticality of (49) is predicted.

The account is also consistent with the ungrammaticality of (31a), repeated below as (53).

- (53) \*who<sub>i</sub> t<sub>i</sub> remembered [the TV show when]

In this case, *when* cannot be an argument for two reasons. First, *TV show* is not argument-taking. And secondly, even if it were, it could not take *when* as an argument since *when* is an NP, not a PP. Hence, *when* must be an adjunct in

(53). This example, like (47b), improves when *of* is placed before *when*.

(54)  $\text{who}_i t_i$  remembered [the TV show of when]

Here, *of when* is clearly an adjunct PP. But *when* itself is an argument of *of*, and hence, is allowed as a Wh-phrase in situ.

#### 4. Locative Phrases in Noun Phrases

In the preceding section, we examined the contrast in (55) in detail.

(55) a.  $\text{who}_i t_i$  bought the book when

b. \* $\text{who}_i t_i$  remembered [the TV show when]

We first rejected the possibility that *when* can be an argument only of an argument-taking lexical head on the basis of examples like (56).

(56) \* $\text{who}_i t_i$  witnessed [the falling of the big trees when]

This example is out despite the fact that the noun *falling* is argument-taking. Observing that there is a genuine asymmetry between Ss and NPs (or verbs and nouns), we argued that this asymmetry provides support for Grimshaw's (1990) theory of argument structure. In this section, we will consider the distribution of the locative Wh-phrase *where* in a parallel fashion.

##### 4.1. A Difference between Temporal Phrases and Locative Phrases

A contrast similar to the one in (55) was found with *where*. The relevant examples (30b) and (31b) are repeated below as (57a-b).

(57) a.  $\text{who}_i t_i$  bought the book where

b. \* $\text{who}_i t_i$  read [the books where]

Since *when* and *where* have shown the same distribution so far, we would expect the counterpart of (56) with *where* to be ungrammatical. However, this expectation is not fulfilled, as the examples in (58) show.

(58) a.  $\text{who}_i t_i$  witnessed (with a remote camera) [the falling of the big trees where]

b.  $\text{who}_i t_i$  criticized [the shooting of rabbits where]

The examples are good with the preposition *of*, as shown in (59), but are good even without it.

(59) a.  $\text{who}_i t_i$  witnessed (with a remote camera) [the falling of the big trees of where]

b.  $\text{who}_i t_i$  criticized [the shooting of rabbits of where]

This fact is particularly surprising given our account for *when*. We explained the ungrammaticality of (56) in terms of Grimshaw's (1990) hypothesis that nouns, as opposed to verbs, can take only PP arguments. And the argument that *when* is not a PP but an NP applies equally to *where*: they both appear as complements to P as we saw in (38), repeated in (60).

(60) a. since when / since then

b. from where / from there

Thus, *where* in (58a), being an NP, cannot be an argument of the noun *falling*. Despite this, the example is grammatical.

Then, how can we accommodate the examples in (58)? (57)-(58) show clearly that *where* can be an argument when, and only when, the lexical head is

argument-taking. It is allowed in situ with the verb *bought* in (57a), the noun *falling* in (58a), and the noun *shooting* in (58b), all of which are argument-taking. But it is out with the concrete noun *book* in (57b). At the same time, given our analysis of *when*, the Wh-phrase *where*, being an NP, cannot be an argument of the noun *falling* in (58a), and the noun *shooting* in (58b). This state of affairs implies that *where* can be an argument of some predicate, distinct from verbs and nouns, that are present only when an argument-taking verb or noun is. The most natural candidate is the event predicate.

"Event" was initially proposed in Davidson (1967), and its role in syntax and semantics has been examined in many subsequent works. Let us assume, as it is plausible, that 'event' is present in the syntactic configuration when, and only when, there is a VP or NP headed by an argument-taking predicate. And let us assume further that 'event' itself is a head that selects those VPs and NPs. (See Stowell (1989) and the references cited there for much relevant discussion on this point.) Then, if *where* can be an argument of the event predicate, the facts in (57)-(58) directly follow. The event predicate is present in (57a), (58a) and (58b), associated with the verb *bought*, the noun *falling* and the noun *shooting*, respectively. Hence, if *where* can be an argument of the event predicate, the grammaticality of these examples are predicted. On the other hand, the event predicate is absent in the object NP in (57b) as the noun *book* is not argument-taking. Consequently, *where* can be an argument neither of the event predicate nor of the noun *book* in this example. Thus, the ungrammaticality of this example is also predicted.

The analysis presented above implies that *when*, unlike *where*, cannot be an argument of the event predicate. This is so, since otherwise, we incorrectly predict (56), repeated as (61) below, to be grammatical.

(61) \* $\text{who}_i t_i$  witnessed [the falling of the big trees when]

One consequence of this is that in the grammatical (55a), shown below in (62), *when* is an argument of the verb.

(62)  $\text{who}_i t_i$  bought the book when

More generally, then, *when*, in principle, can be an argument of an argument-taking verb or noun. However, it cannot be an argument of a noun because nouns take only PP arguments. As there is no reason to suppose that *where* is different here, we assume that it also can be an argument of a verb. But in addition, *where*, unlike *when*, can be an argument of the event predicate. And this accounts for the grammaticality of (58a-b).

The final question that remains is why only *where*, and not *when*, can be an argument of the event predicate. Although we do not have an answer to this question at this point, we will briefly speculate on this problem in the following subsection.

##### 4.2. The Incompatibility of *When* and the Event Predicate

The locative *where/there* and the temporal *when/then* have similar relations to the event predicate. It seems then reasonable to assume that if the former can be an argument of the event predicate, the latter also can, at least in principle. If this line of reasoning is on the right track, then there should be a specific factor

that prevents the temporal *when/then* from being associated with the event predicate.

Here, one possibility is that the event predicate already has a temporal element associated with it, and that temporal element blocks *when/then* from being an argument. Or more concretely, because that temporal element is already present, the association of *when/then* with the event predicate forces the predicate to have two distinct elements with the "temporal role," and that results in a violation of the theta-criterion, or more generally the principle of Full Interpretation. And there are in fact candidates for that "other temporal element." In the remainder of this section, we will briefly discuss two of them.

Larson (1990) considers the ambiguity in the interpretation of the temporal adverbial clauses such as (63), and argues for the existence of a temporal operator.

- (63) before [John said [Mary would arrive]]

This clause can be interpreted as in (64a) or as in (64b).

- (64) a. before the time of John's saying that Mary will arrive  
b. before the time of Mary's arrival as predicted by John

Larson (1990) argues that in (63), an empty temporal operator moves to the Spec position of the CP complement of *before*, and attributes the ambiguity in interpretation to the ambiguity in the initial position of the operator. If the operator originates in the higher clause in (63), we have the interpretation in (64a). On the other hand, if it comes from the most deeply embedded clause, the interpretation we obtain is that in (64b). Larson (1990) shows that the temporal operator movement he proposes exhibits Subjacency effects as predicted.

Although Larson (1990) assumes that the base position of the empty temporal operator is identical to that of *when*, Miyamoto (1992) argues to the contrary. More specifically, he first shows that the ambiguity observed in (63) obtains in Japanese also, and then, demonstrates that the temporal operator exhibits island effects much more strongly than the Japanese counterpart of *when*, *itu*. The conclusion he draws is in fact that the empty temporal operator is generated in the TP Spec position, whereas *itu* can be an argument of the verb.

If we accept some of Miyamoto's conclusion and assume that the empty temporal operator appears in the Spec position of the event predicate, then it is a temporal phrase associated with this predicate.<sup>9</sup> And if we assume further that the operator is always present in an event projection, then an event predicate always has a temporal argument distinct from *when/then*. It is thus possible that the temporal operator blocks *when/then* from being associated with the event predicate. This speculation seems consistent with our conclusion that *where/there* can be an argument of the event predicate: as far as we know, an ambiguity of the kind observed in (63) has not been reported with location, and there is no evidence for a locative empty operator.

Another, totally independent, possibility is that the event predicate we have postulated is the T (ense). Miyamoto (1994), discussing the distribution of secondary predicates, presents evidence that T is present in NPs headed by argument-taking nouns, but not in those headed by concrete nouns. Thus, our analysis of *where* is unaffected even if we assume that *where*, but not *when*, can be an argu-

ment of T. And in this case, it seems possible that *when* cannot be an argument of T because both are temporal elements. That is, a temporal head cannot take a temporal argument. This speculation also is consistent with our analysis of *where*, since it is not a temporal phrase.

## 5. Conclusion

In this paper, we examined the place of *when/then* and *where/there* in the argument structure of sentences and noun phrases. Some of the crucial examples are repeated in (65)-(66).

- (65) a.  $\text{who}_i t_i$  bought the book when  
b. \* $\text{who}_i t_i$  remembered [the TV show when]  
cf.  $\text{who}_i t_i$  remembered [the TV show then]  
c. \* $\text{who}_i t_i$  witnessed [the falling of the big trees when]  
cf.  $\text{who}_i t_i$  witnessed [the falling of the big trees then]
- (66) a.  $\text{who}_i t_i$  bought the book where  
b. \* $\text{who}_i t_i$  read [the books where]  
cf.  $\text{who}_i t_i$  read [the books there]  
c.  $\text{who}_i t_i$  witnessed (with a remote camera) [the falling of the big trees where]

As *when* in (65b) and *where* in (66b) are clearly adjuncts, these examples are straightforwardly ruled out. We argued that these Wh-phrases, in principle, can be arguments of argument-taking lexical heads. Thus, *when* in (65a) and *where* in (66a) can be construed as arguments of the verb *bought*. Also, *when* in (65c), in principle, can be an argument of the noun *falling*. The ungrammaticality of this example, we argued, provides support for Grimshaw's hypothesis that nouns, as opposed to verbs, can take only PP arguments. Since *when* is an NP, it cannot be an argument of *falling*. As the example is good with *then* in place of *when*, it is not that *when/then* receives no interpretation within NPs. Although they cannot be arguments, they can be construed as adjuncts. (65c) is out because an adjunct Wh-phrase cannot appear in situ.

The grammaticality of (66c) shows that *where* can be an argument in an NP headed by an argument-taking noun. But since it is an NP exactly like *when*, it cannot be an argument of the noun *falling*. This implies that there is another head within the NP that takes *where* as an argument. We suggested that it is the event predicate. The contrast between (65c) and (66c), then, shows that *where/there*, but not *when/then*, can be arguments of the event predicate. Finally, we speculated on the reason for this difference between *where/there* and *when/then*.

Given our analysis, there are many possible positions for *there* in (67).

- (67) John bought the book there

It can be an argument of the verb *bought*, an adjunct associated with this verb, an argument of the event predicate, or an adjunct associated with the event predicate. But at least some of these options are excluded in all of the examples in (65)-(66). In the case of *where* in (66a), the adjunct readings are excluded, as adjunct Wh-phrases are not allowed in situ. And *when* in (65a) has only one possible reading: it must be an argument of the verb *bought*. This is so, since *when*



/then cannot be associated with the event predicate, and only argument Wh-phrases are allowed in situ. Even this final option is excluded in (65c), as nouns do not take NP arguments. It is ungrammatical examples such as these that give us clues to the possible structures of simple sentences like (67).

## NOTES

Section 2 of this paper is an extended version of a part of Murasugi (1991), presented at the Tokyo Linguistics Forum (1991), and Murasugi and Saito (1993), presented at the 22nd Western Conference on Linguistics held at the University of Arizona, Tucson, and also in colloquia at the University of California, Irvine, the University of Delaware, and Harvard University. We benefited from discussions with many people; we would like to thank in particular, Mamoru Saito, Roger Martin, Tim Stowell, Chris Tancredi, and Shuji Chiba.

<sup>1</sup> As we will see below, the notion of "referentiality" employed by Aoun is quite indirect. Cinque (1990) and Rizzi (1990) appeal to this notion in a more straightforward way.

<sup>2</sup> See also McCawley (1988) for relevant discussion on this point.

<sup>3</sup> More precisely, Aoun proposes that the traces of *what*, *whom*, *when* and *where*, but not those of *why* and *how*, should be considered R-expressions, which are subject to Condition (C). Then, the fact that only the former Wh-phrases can appear in situ follows from his generalized binding theory.

<sup>4</sup> The precise formulation of Subjacency and the ECP is not crucial for the argument to be presented below. What is important is that the movement of an argument Wh-phrase as in (19a) is a Subjacency violation, while the movement of an adjunct Wh-phrase out of an NP is excluded by the ECP.

<sup>5</sup> Note that (21) cannot be excluded (say, by the ECP) on the ground that an adjunct PP has an empty head. If an empty P cannot head an adjunct PP, then it should not be allowed even in the grammatical (7a-b). More generally, if an empty P can appear only in an argument PP, then the postulation of the empty P itself loses its motivation.

<sup>6</sup> In this respect, *then* differs from *yesterday*, which can appear in genitive, as shown below.

(i) yesterday's lecture

See Anderson (1978) for a detailed discussion on *yesterday* in the subject position of an NP.

<sup>7</sup> It should be possible for *when* to be in an adjunct position, since (47b) is grammatical with *then* in place of *when*, as shown below.

(i) who<sub>i</sub> t<sub>i</sub> witnessed [the falling of the big trees then]

*Then*, like *when*, is an NP, and hence, cannot be an argument of the noun *falling*.

<sup>8</sup> (49) is awkward for some people but is no worse than (i), where *then* is substituted for *when*.

(i) who<sub>i</sub> t<sub>i</sub> witnessed [the falling of the big trees of then]

Thus, the awkwardness has nothing to do with a Wh-phrase appearing in situ.

<sup>9</sup> Or alternatively, we may assume that the event predicate we postulated is in fact T, and maintain Miyamoto's hypothesis, as it is, that the empty temporal operator is in TP Spec. See below for relevant discussion.

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