ERI TANAKA

THE MENTAL PROCESSING OF LOGOPHORICITY IN ENGLISH*

1 INTRODUCTION

This paper focuses on the mental representation of so-called logophoricity and anaphoric relation between full noun phrases and pronominal anaphora in the logophoric context. We will see that the logophoricity is licensed by certain type of predicates, and claim that the verbs that represent the subject's speech, thought and feelings have in their semantic representation some particular type of discourse role. The appropriateness of the representation is evidenced by the co-reference facts in the context.

In this paper, we will especially examine the anaphoric relation in the following type of constructions. The intended co-reference is indicated by italics throughout this paper.

(A) a. * That *John* was the champ was claimed by *him*.
    b. That *he* was the champ was claimed by *John*.
(B) a. That *John* was sick bothered *him*.
    b. That *he* was sick bothered *John*.

As observed in the above examples, both forward and backward pronominalization are possible in some cases (i.e. the type B), but only backward pronominalization is permitted in the other cases (i.e. the type A).

We claim that this contrast is not syntactic in nature, but semantic/pragmatic in nature, for the semantics of verbs determines the availability of co-reference, as we will see later. We propose the semantics of each type of verb in terms of the Mental Space Theory, established mainly by Fauconnier (1985, 1997) and Dinsmore (1991).

This paper is organized as follows: In the next section, we will examine the three previous analyses and point out problems. In section 3, we will introduce the Mental Space Theory briefly. In the fourth section, we will first discuss the difference between the two relevant notions: logophoricity and point-of-view. Then we propose the mental representation of two types of predicates. Section 5 will discuss the level of understanding of reference of pronominal anaphora. We will claim that the

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relevant level is the discourse level. Then, we will propose the constraint that governs the co-reference option in the logophoric context. Then we will examine how the constraint works in the previously proposed representations. Section 6 will be a general conclusion.

2 Previous Analyses and Their Problems

We will begin by reviewing the three main previous analyses in turn, each of which is based on different theoretical frameworks. The analyses examined here include Reinhart (1983), Kuno (1972), and van Hoek (1997). They provide a good starting-point for further discussion on the phenomenon. In particular, their analytical diversity suggests the existence of a mapping procedure from syntactic structure to discourse construction, as I will claim later.

2.1 Reinhart (1983)

In this section, I will briefly review Reinhart (1983) and suggest a shortcoming. She shows that the availability of the anaphoric relation between an antecedent and a pronoun is dependent on the syntactic relation they are in. She defines the syntactic notion 'c-command', which is superior to the previously assumed "command and precedence" as a constraint of co-reference between pronouns and full NPs. The definition of Reinhart's c-command is given below.

(1) A node A c-commands a node B if the branching node α_1 most immediately dominating A either dominates B or is immediately dominated by a node α_2 which dominates B, and α_2 is of the same category type as α_1.
(Reinhart 1983: 41)

C-command is used to define the syntactic domain of a node.

(2) The domain of a node A consists of all and only the nodes c-commanded by A. (Ibid.)

She then states the anaphora condition in terms of these.

(3) A given NP must be interpreted as non-coreferential with any distinct non-pronoun in its c-command domain. (Reinhart 1983: 43)

Note that this interpretation rule is applied at S-structure.

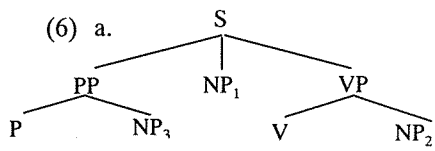
To see how the interpretation rule works, consider first the next sentences.

(4) a. * Near *Dan*, *he* saw a snake.
b.* *He* was fired since *McIntosh*'s weird habits had finally reached an intolerable stage.

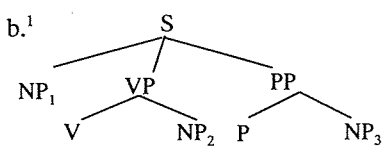
(5) Near *him*, *Dan* saw a snake.

The syntactic structures of (4) and (5) are schematically represented in (6).

(6) a.



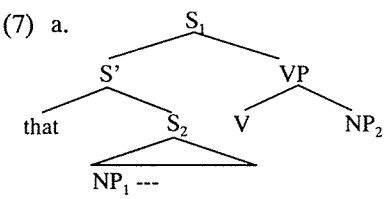
b.[1]



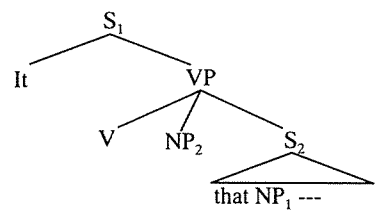
Note that according to the definitions (1) and (2), NP_1 c-commands both NP_2 and NP_3 in both (6a) and (6b). As for NP_3, it c-commands neither NP_1 nor NP_2 in both cases. In (4a) and (4b), the antecedents of pronouns, *Dan* and *McIntosh*, correspond to NP_3 in (6a) and (6b), respectively. They are c-commanded by NP_1s, *he*s, and thus, apparently they violate (3). In (5), despite the precedence of pronoun, (3) correctly predicts that the pronoun and the full NP can co-refer.

Her analysis makes a correct prediction also in extraposed constructions:

(7) a.



b.



(8) a. That *Rosa* has failed bothered *her*.
b. That *she* has failed bothered *Rosa*.

(9) a. It bothered *Rosa* that *she* has failed.
b. * It bothered *her* that *Rosa* has failed. (Reinhart 1983: 48)

In (7a), since neither NP_1 c-commands NP_2, nor NP_2 c-commands NP_1, the co-reference between them is predicted to be free. Thus, both (8a) and (8b) are allowed. On the other hand, in (7b), since NP_1 does not c-command NP_2 and NP_2 *does* c-command NP_1, the asymmetrical co-reference option is observed as in (9a) and (9b).

Reinhart's c-command analysis resolves preceding analyses' defects in a systematic way. However, it cannot be extended to explaining the following contrast:[2, 3]

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[1] NP_3 may not be immediately dominated by PP node. P(reposition) may have sentential complement as in (7b).

[2] (12) is originally from Hinds (1973), cited by Reinhart (1983). Although the original judgment is "?", I treat this as ungrammatical, following Kuno (1972).

(10) a. That *he* would be a candidate was announced by *McIntosh* yesterday.
b.* That *McIntosh* would be a candidate was announced by *him* yesterday.
(Reinhart 1983: 95)

(11) a. That *he* will be elected is expected by *John*.
b.* That *John* will be elected is expected by *him*. (Kuno 1972: 161)

The examples in (10) and (11) have analogous structures as (7a), which means that all these examples are predicted to be grammatical, contrary to the fact.

Hinds claims that the above contrast is due to the changed function induced by passivization. He assumes the principle in (12) that governs generally the acceptability of pronominalization.

(12) A function of pronominalization is to indicate that the referent of the pronoun is marked as thematic material.
(Hinds 1973: 33, cited in Reinhart 1983: 95)

According to Hinds, the unacceptability of (10b) and (11b) comes from the fact that passive transformation marks the matrix deep structure subject as 'rheme', but the pronominalization marks it as 'theme'. However, there is evidence that the ungrammaticality of these sentences should not be attributed to passive formation.[4]

(13) a. That *he* had an appointment at two was forgotten by *John*.
b.? That *John* had an appointment at two was forgotten by *him*.
(Kuno 1972: 161)

Kuno says that although these sentences are awkward, they are considerably better than (10b) and (11b). If this observation is correct, the difference in acceptability between (10b) and (11b) on the one hand and (13b) on the other should be explained in terms of other than passive formation. This is why I reject Hinds' explanation.

We have seen thus far that the constraint (3) does not work in the examples (10), (11), and (13), and another possible explanation also fails to explain them.

In this section, Reinhart's analysis was briefly reviewed and an empirical problem was raised. I will review another previous study, Kuno (1972), in the next section.

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[3] I am aware that these passives are not good from a stylistic point of view. One might argue that the oddness of these sentences should not be attributed to syntactic structure.

[4] Reinhart notes that (12) cannot explain the following typical construction:
(a) *Ben* said that Rosa likes *him*.
(b) **He* said that Rosa likes *Ben*.
According to Reinhart, both (a) and (b) violate (12). The matrix subject is generally assumed to be theme, therefore, according to (12), (b) should be allowed. Moreover, in (a), the pronoun is in a rheme, thus it also violates (12).

2.2 Kuno (1972)

Kuno (1972) is known as a functionally oriented study for pronominals. He points out the effect of so-called 'point-of-view' to the application of transformation.

Kuno (1972) first observes the following contrast.

(14) a. That *he* will be elected is expected by *John*.
b.* That *John* will be elected is expected by *him*.
(15) a. That *he* was the best boxer in the world was claimed by *John*.
b.* That *John* was the best boxer in the world was claimed by *him*.
(16) a. That *he* was sick was denied by *John*.
b.? That *John* was sick was denied by *him*.
(17) a. That *he* had an appointment at two was forgotten by *John*.
b.? That *John* had an appointment at two was forgotten by *him*.
(Kuno 1972: 161-162)

As already observed in 2.1, while in (14) and (15), the forward pronominalization is not allowed, in (16) and (17), both forward and backward pronominalizations are allowed. Kuno observes further that the difference in acceptability is dependent on the class of verbs. The verbs such as *expect, claim*, and *request* show the same paradigm as (14) and (15). The verbs such as *deny, forget* and *be unaware of* show the same acceptability as (16) and (17). One of the differences between the two classes of verbs is that, Kuno (1972) claims, the content of the complement clause of the former represents the direct discourse of the matrix subject, while this is not the case for the latter.

He then proposes the following deep structures for the verbs that allow direct discourse.

(18) a. John expects, "*I* will be elected."
b. John claimed, "*I* am the best boxer in the world." (Kuno 1972: 163)

On the other hand, the verbs that do not allow direct discourse are assumed to have the following deep structures.

(19) a. John denied (the rumor) that John was sick.
b. John forgot (the fact) that John had an appointment at two. (Ibid.)

The verbs which have direct discourse in their complements at deep structure undergo a transformation that Kuno calls Indirect Discourse Formation, and then the first person pronoun *I* becomes *he* through the transformation. Since it is a pronoun from the beginning, it can not be realized as full noun *John*. Therefore, only (14a) and (15a)

are generated.

The *deny*-type verbs have different derivation processes. Since they do not have as their deep structures direct discourse, the embedded subjects are not obligatorily pronominalized. The order of passive formation and pronominalization determines which sentence is derived.

This analysis explains the difference in meaning of the sentences that allow both forward and backward pronominalizations.

(20) a. That *John* was sick worried *him*.
b. That *he* was sick worried *John*.

Kuno observes that while (20a) implies that someone else said that John was sick and this statement worried him, (20b) has an additional meaning to the effect that John's realization or feeling that he was sick worried him. (20a) is assumed to have (21a) at deep structure, and (20b) is assumed to have (21b).

(21) a. The fact that *John* is sick worried *John*.
b. "*I* am sick" worried John.

Kuno's direct discourse analysis seems to be very plausible and promising and I think it is intuitively correct. However, his formulation of the theory cannot deal with various contextual factors. Consider first the following sentences.

(22) a. That *Rosa* has failed should have bothered *her*.
b. That *she* has failed should have bothered *Rosa*. (Reinhart 1983:48)

If we assume that the deep structures for (22) are analogous to (20), the deep structure for (22b) will be an ill-formed sentence.

(23) * "*I* have failed" should have bothered Rosa.

Therefore, the analysis predicts ungrammaticality of (22b), contrary to the fact. The ungrammaticality of (23) is due to the fact that the meaning of auxiliary *should* is not consonant with the direct discourse form. However, the surface form is not affected by the presence of *should*.

Consider then the following examples:

(24) a.* Learning that *John* was sick bothered *him*. (Kuno 1972: 168)
b. Knowing that *John* is perfect naturally pleases *him*.
(Bolinger 1979: 296)

(25) a.* It surprises *him* that *John* is so well liked.

b. It obviously surprises *him* that *John* is so well liked.
(Bolinger 1979: 290)

The assumed partial deep structure of (24a) is represented below.

(26) * John learned that John was sick

The unrealized subject of gerundive *learning* is understood to be *John*. The partial deep structure in (26) is not grammatical, because the co-referential subject in the embedded clause is realized not as a pronoun but a full NP. If this is also true to (24b), it should also be ungrammatical, contrary to the fact. The difference between (24a) and (24b) lies in the existence of the adverb *naturally*. In (25a) and (25b), the same kind of contrast is observed. In this case, the difference between them is due to the existence of *obviously*. These adverbs are what Bellert (1977) calls "modal adverbs", which are defined as predicates whose argument is the truth of the proposition. In examples (22a,b), the modal auxiliary does not affect the grammaticality, but in this case, the modal adverb, which is assumed to have basically the same function as modal auxiliary, does affect the grammaticality. The fact that the existence of these adverbs makes sentences acceptable and the modal auxiliary in (22) does not affect the grammaticality requires systematic explanation.

In this section, Kuno's analysis has been reviewed and the problems have been pointed out. I will turn to the cognitive linguistic approach in the next section.

2.3 van Hoek (1997)

van Hoek (1997) works on this area in the framework of cognitive grammar established by Langacker (1987, 1991). She proposes that the notion "conceptual reference point" is the crucial factor for understanding the reference of pronominal anaphora. Reference point model is originally formulated by Langacker (1991, 1993), having as its internal component, reference point, target, and dominion. Dominion is defined as a set of possible targets. In Langacker's original works, its scope of explanation is limited to metonymy, genitive constructions, nested locatives and *have* constructions. She extends this notion to sentence level organization, and defines a subject as a reference point for a whole sentence. Reference point is described as "the ability to invoke the conception of one entity for purposes of establishing mental contact with another" (Langacker 1993: 5). van Hoek claims that the combination of the extended reference point model and the accessibility theory of Ariel (1988) gives a natural explanation to an anaphora constraint without a notion like c-command. Her main contribution is that she shows that even the seeming 'structural' effect can be explained by a discourse/cognitive constraint.

First, let us consider how the following well-known contrast is explained under this theory.

(27) a. Near *him*, *Dan* saw a snake.
b.* Near *Dan*, *he* saw a snake.

Assume that a subject is a reference point for a whole sentence which includes other elements (e.g. entities marked by accusative and oblique) in its dominion. Assume further that the less accessible elements cannot be in the dominion of more accessible elements. The accessibility of noun phrases forms the scale below:

(28) proper name > definite description > demonstratives > stressed pronoun > pronoun > reflexives > zero anaphora (Cf. Ariel 1988: 84)

In the scale (28), the left most element is the least accessible, and the right most element is the most accessible.

With these assumptions, (27) is explained as follows: In (27), the prepositional object is in the dominion of the subject. Pronouns are more accessible than proper nouns according to the scale (28). Therefore, a proper name cannot be in a dominion of a pronoun. While (27a) observes this constraint, (27b) violates it because the proper name *Dan* is in the dominion of the pronoun *he*.

The above discussion shows that reference point can be understood to be "topic" or "theme" in more traditional terms. It differs from topic/theme only in that it refers to general cognitive ability, not to linguistic proper notion. van Hoek also subsumes the notion "point-of-view" into reference point.[5] Point-of-view can be identified with "empathy" or "camera angle" in this case. Below is van Hoek's description of point-of-view:

(29) "Point-of-view" refers to the conception of an animate entity, typically a person, from whose perspective a conception is construed.
(van Hoek 1997: 200)

The extension of 'reference point' to the extent that it includes point-of-view makes it possible to explain the unacceptability of the next sentence, taken from Kuno (1987):

(30) * That *John* would be elected was anticipated by *him*.

[5] Langacker(1997) extends his reference point model to "focal chain". He attempts to generalize into this model various notions such as theme, empathy (or point-of-view), trajector/landmark alignment, profile/base distinction and symbolization. In focal chain model, a dominion is defined as a context which is determined by prior focus of attention.

In (30), the content of *that*-clause subject is regarded as being viewed from *John*'s point-of-view, and thus it is considered to be in the dominion of the pronoun *him*. If we identify point-of-view with reference point, a less accessible element cannot be in a dominion of a referent of a point-of-view (i.e. a reference point). This constraint leads (30) to be judged ungrammatical. She also claims that (30) is not a special case in which the point-of-view effect is observed, and that it is revealed in more "usual" sentences such as (27b) and (31):

(31) * *He* saw a snake near *Dan*.

She reports that for some speakers "the sentences sound as if Dan somehow saw himself at some distance away" (van Hoek 1997: 200).

van Hoek's explanation goes further with the following sentences. % stands for variable judgments among her informants.

(32) a. % The possibility that *Jim* might have AIDS frightened *him*.
b. The possibility that *Jim* might have AIDS was hidden from *him*.
(van Hoek 1997: 201)

She reports further that when the sentences are embedded in a context, the judgments of grammaticality become clear.

(33) John took a moment to gather his nerve before opening the envelope from the testing center. This had been the longest week of his life, but now, with the results in hand, he found it easy to wait a few more minutes before finding out. *The idea that John might have AIDS was terrifying*.
(van Hoek 1997: 207, emphasis mine)

According to van Hoek, when (32a) is embedded in context (33), many informants report that (32a) (i.e. the final sentence in (33)) is unacceptable. She notes also that some speakers accept it as grammatical, because it sounds like narrator's descriptions of the characters' states. Anyway, as far as my informants concerned, sentences similar to (32a) are judged to be positive:

(34) a. The possibility that *Mary* was pregnant bothered *her*.
b. The possibility that *she* was pregnant bothered *Mary*.
(35) a. The possibility that *John* might have AIDS bothered *him*.
b. The possibility that *he* might have AIDS bothered *John*.

On the basis of this observation, we regard (32a) as good here. Of course, the degrading of accessibility in (33) must be explained in the theory. I will return to this

question in chapter 5.

van Hoek's explanation to the ungrammaticality of (30) is based on the assumption that the (active) subject of the verb is a point-of-view bearer of the complement clause (i.e. that he would be elected). However, if we replace the verb with *deny* or *forget*, the same explanation cannot be applied. Consider the next sentences:

(36) a. That *John* was sick was denied by *him*.
b. That *John* had an appointment at two was forgotten by *him*

The problem is that van Hoek (1997) identifies point-of-view with logophoricity. As we claim later, (31) is not an instance of point-of-view conflict, but a logophoricity effect. On the other hand, the examples (32)-(36) are treated as manifestations of point-of-view effect.

The next examples show the same point. The explanation of van Hoek is that since *Rosa*, a point-of-view, is not aware of the content of that clause, (37a) is allowed. However, it is followed by (37b).

(37) a. Someone was shouting behind *her* that *Rosa*'s driving was insane.
b. Rosa heard it but she ignored it.

The fact that (37a) can be followed by (37b) indicates that we should attribute this problem to other factors than point-of-view.

2.4 Summary

In this section, we have reviewed three previous analyses. The problems raised here are: (a) syntactic notion only cannot explain the data presented in the introduction, (b) the contextual effect produced by modal adverbs, or the preceding discourse should be taken into account, and (c) it is not possible to reduce all the data to the point-of-view effect.

In the next section, we introduce our theoretical framework, Mental Space Theory.

3 THEORETICAL FRAMEWORK

In this section, we will review some of the relevant notions of the Mental Space Theory, on which we rely in this article. We basically follow Fauconnier (1985), Cutrer (1994), and Dinsmore (1991).

3.1 Mental Spaces and Space Configurations

Like the other streams of Cognitive Linguistics, the Mental Space Theory claims that there is a 'cognitive' level distinct from linguistic expressions and representations of the real or metaphysical world, at which language understanding is done. At the cognitive level, we understand language through the construction of hierarchically organized and interconnected domains, which are called 'mental spaces' here. Linguistic expressions are considered to be a mere 'clue' to these constructions.

Linguistic expressions are regarded as partial and undetermined instructions for constructing mental spaces. By using linguistic instructions, we can construct spaces, divide and partition information into different spaces, structure and introduce elements and their relations within each space, and connect elements to counterparts in other spaces.

One of the functions of the language instructions is to designate a construction of a new space or refer back to one already introduced in the discourse. These linguistic instructions are called "space builders", which take a variety of grammatical forms. Below are some examples:

(38) Space Builders
  a. Prepositional phrases: *in Len's picture, in John's mind...*
  b. Adverbs: *probably, possibly, really ...*
  c. Connectives: *if A then B, either A or B*
  d. Subject-verb combinations: *Max believes---, Mary hopes---*
     (Fauconnier 1985: 17)
  e. Tense, Mood (cf. Cutrer 1994, Mejías-Bikandi 1996)

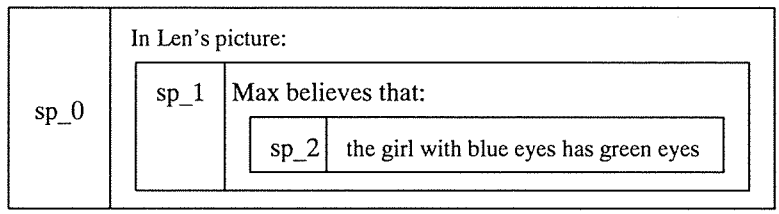
The spaces introduced by space builders are always embedded into some higher order space. The outermost space R is by default the space representing the speaker's reality. Only the outermost space has no 'parent' space, that is, it is not embedded into another space. The speaker's reality space is often not introduced by linguistic expressions, but introduced implicitly.

The subordination of spaces may be realized as a subordination of grammatical constructions, as the following example shows.

(39) In Len's picture, Max believes that the girl with blue eyes has green eyes.

The space introduced by *in Len's picture* is subordinated to the space R, and the space introduced by *Max believes* is subordinated to 'Len's picture' space. Following Dinsmore (1990), in this article I represent hierarchically ordered space configurations both in box notation and in linear notation. Both types of the representations of the example (39) are presented below:

(40)



(41) sp_0 | In Len's picture [| sp_1|]
sp_1 | Max believes [|sp_2|]
sp_2 | the girl with blue eyes has green eyes

3.2 Accessing the Spaces

The question of when the information is divided into spaces is important in the Mental Space Theory. One clue to the question is the existence of previously mentioned space builders. When the space builders appear in context, we can understand the information is partitioned into some space different from its parent. We will argue in this section the appropriateness of space configurations.

Dinsmore (1990) argues that the functionality of partitioned representations is manifested only if spaces are properly configured. The principles that he proposes are coherence and consolidation. The coherent spaces are spaces in which inference successfully woks. Consider two potential representations for (42):

(42) If Warren ate a bug then Warren is a Bulgarian spy. (Dinsmore 1990: 52)
(43) sp_1 | Warren ate a bug → [|sp_2|]
sp_2 | Warren is a Bulgarian spy
(44) sp_1 | [|sp_3|] → Warren is a Bulgarian spy
sp_3 | Warren ate a bug

We can infer from *Warren is a Bulgarian spy* that *Warren is from Bulgaria*. Thus, we have the following representation in sp_2, and the original sentence (42) entails (46):

(45) sp_2 | Warren is from Bulgaria
(46) If Warren ate a bug then Warren is from Bulgaria

On the other hand, in the representation in (44), we can infer from *Warren ate a bug* that *Warren ate something*. In this case, however, the original sentence (42) does not entail (48). Therefore, (44) is not an appropriate internal representation for (42).

(47) sp_3 | Warren ate something
(48) If Warren ate something then Warren is from Bulgaria

The other principle that Dinsmore proposes is consolidation. When the information is divided into spaces, we have to determine which space the information is added to. The internal structures of a space consist only of non-contradicting information to keep

their coherency. As far as the newly added information does not contradict information in situ, the information is consolidated into the space. Therefore, in the following example, all the contents of John's beliefs are added into one space, that is, sp_5.

(49) John believes that the president of the U.S. is Bill Clinton. He believes that Mary has a son.

(50) sp_0 | John believes that [|sp_5|]
sp_5 | the president of the U.S. is Bill Clinton
sp_5 | Mary has a son

John's conviction need not be the same as the speaker's conviction. Thus, it is useful to represent them in a separate space.

In the above case, John's belief is realized by the same linguistic expression, *John believes*. However, as I have argued elsewhere, [6] the same expression may or may not be a space builder. Consider the following examples:

(51) a. John is riding a horse in Len's picture.
b. Mary found a scratch in Len's picture.

The spatial modifier *in Len's picture* can be understood as a space builder. If the modifier functions as a space builder, the internal representations of (51) are represented as follows:

(52) a. sp_0 | In Len's picture [|sp_8|]
sp_8 | John is riding a horse
b. sp_0 | In Len's picture [|sp_9|]
sp_9 | Mary found a scratch

In (52a), John's riding a horse is satisfied only in sp_8. It may not be satisfied in sp_0. This is what we can infer from the corresponding linguistic expression (51a), which does not entail (53).

(53) John is riding a horse.

On the other hand, (51b) does entail (54).

(54) Mary found a scratch.

This means that we understand the sentence (51b) without partitioning of information as represented in (52b). (52b) should be modified to (55).

(55) sp_0 | Mary found a scratch in Len's picture.

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[6] See Tanaka (2000).

This contrast in entailment shows that even the same linguistic expression does not always function as a space builder. We have to examine the entailment relation carefully.

3.3 Discourse Notions of Spaces

Thus far, we have seen how information is partitioned into a space, and which space the information should be added to. As noted above, spaces, except for the very beginning of the discourse, must be embedded into some higher order space. The starting space usually lies in the speaker's reality space, and the succeeding discourse unfolds from that space. The space in the top of a hierarchy (in this case, R) is called BASE. Dinsmore (1990) and Cutrer (1994) propose that each space plays some role in discourse. The BASE space is defined as the initial or origin space. Other space primitives that are relevant here are FOCUS and VIEWPOINT.[7]

The FOCUS space is "the space where meaning is currently being constructed. It is the current and most active space; the space which an utterance is about" (Cutrer 1994: 71). The VIEWPOINT space is the center of conceptualization and consciousness of the self to whom an utterance is attributed.

The newly constructed spaces always function as FOCUS. They contain the information that is encoded by verbal predicates. On the other hand, the VIEWPOINT space can be variable from context to context. In the present theory, we can identify the VIEWPOINT space through the interpretation of noun phrases. In the next example, the indefinite noun phrase *a millionaire* is ambiguous. On one reading, it has a specific reading, that is, it refers to some man in the real world. Another reading for it is that it refers not to a specific man but to anyone who satisfies the property being a millionaire.

(56) Mary wants to marry a millionaire.

The ambiguity manifested in the above example is to be explained according to where the indefinite is accessed from. Consider the following representation for the specific reading of the indefinite:[8]

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[7] The notion "FOCUS" was first proposed by Dinsmore (1990). BASE, EVENT, and VIEWPOINT are proposed in Cutrer (1994). Since the EVENT space does not matter here, we omit it from the discussion.

[8] The dot indicates the existence of the object or person in the space. F is a pragmatic function that connects two objects. This is ensured by what Fauconnier (1985) calls Identity Principle. The definition of Identity Principle is as follows:

(i) If two elements *a* and *b* are linked by a connector F(b =F(a)), then element *b* can be identified by naming, describing, or pointing to its counterpart *a*. (Fauconier 1997: 41)

The rule for indefinite interpretation is presented below (Dinsmore 1990: 144).

(ii) Conditions: S | X "(NP a D) NP" Y
Actions: create an object, W
S | W is D
S | X W Y

(57) sp_0 | ● person_1
sp_0 | person_1 is a millionaire
sp_0 | Mary wants [|sp_10|]
sp_10 | Mary marries person_2
sp_10 | person_2 = F (person_1)

In this case, the indefinite is introduced into sp_0, and the object in sp_10 is accessed from that space. In this case, sp_0 functions as VIEWPOINT space.

On the other hand, with non-specific reading of the indefinite, consider the following representation.

(58) sp_0 | Mary wants [|sp_11|]
sp_11 | ● person_2
sp_11 | ● person_2 is millionaire
sp_11 | Mary marries person_2

The VIEWPOINT space is considered to be in sp_11, in this case. This is ensured further by the following argument.

It is well known that with the non-specific reading, indefinites cannot be referred to by pronouns in 'indicative' context. Assume that (56) is followed by (59a) or (59b).

(59) a. He will be an old fat man.
b. He is an old fat man.

The pronouns in both (59a) and (59b) are intended to refer to *a millionaire* in the preceding sentence. When the indefinite is read as referring to a non-specific person, only the co-reference in (59a) is available. While *he* in (59a) refers to a person in 'irrealis' context, the pronoun in (59b) is understood to refer to some person in a real world. Thus, in the latter case, there is no antecedent for *he* in the appropriate space. In this case, the space that the pronominal reference is established is identified as the VIEWPOINT space.

It is important to emphasize here that the spaces serving as VIEWPOINT and the ones serving as FOCUS should be distinguished. Even though a space serves as FOCUS, the space may not be VIEWPOINT, as the above examples show.

3.4 Summary

In this section, we have reviewed the formal mechanism taken in this paper. We have the ability to partition information conveyed by linguistic expressions into various spaces, constructing coherent reality. We also showed that we can make use of the pragmatic function within and between spaces. We introduced three discourse roles in discourse, and explained their functions in the understanding of linguistic expressions.

Let us describe explicitly the representation of factive predicates and speech verbs in the next section in terms of the mechanism presented in this section.

4 PARTITIONED INFORMATION IN FACTIVES AND SPEECH VERBS

The ultimate goal of this section is to supply mental representations of factives and speech verbs in terms of the Mental Space Theory. As we will see later, the distinction between factives and speech verbs is relevant to the availability of co-reference that we are considering here. However, before turning to the topic, we will argue that the notions of point-of-view and logophoricity should be distinguished.

In the next subsection, I will first discuss the difference between point-of-view and logophoricity. I claim that the notion logophoricity is relevant to both factives and speech verbs, but point-of-view effect is seen only in the former. I, then, will show that the distinction between factives and speech verbs corresponds to the possibility of forward pronominalization. These discussions enable us to give the representation of these verbs in terms of Mental Space Theory.

4.1 Logophoricity and Point-of-View

In section 2, we discussed the problem concerning the notion point-of-view. It was pointed out there that point-of-view effect seems not to be observed in some examples. In this section, we will first distinguish the notion of point-of-view and that of logophoricity, which are often confused to be the same.

First of all, let us see again the characterization of point-of-view by van Hoek.

(60) "Point-of-view" refers to the conception of an animate entity, typically a person, from whose perspective a conception is construed.
(van Hoek 1997: 200)

There is a well-known constraint that says that there must be only one point-of-view for each sentence or discourse. Recall that she attributes the ungrammaticality of the example (61) to point-of-view conflict, but this explanation cannot be extended to the examples in (62) (see section 2.3).

(61) * That *John* would be elected was anticipated by *him*.
(62) a. That *John* was sick was denied by *him*.
b. That *John* had an appointment at two was forgotten by *him*.

The problem of the above analysis comes from the identification of logophoricity with point-of-view. Logophoricity is the notion that was originally used to describe the existence of logophoric pronouns in African languages, which are morphologically distinct from other personal pronouns. Logophoric pronouns are pronouns that are used to refer to the person whose speech, thoughts, or feelings are reported or reflected

in a given linguistic context.[9] We claim that point-of-view effect is concerned only with the grammaticality of (62), and the ungrammaticality of (61) is related to logophoricity. The canonical use of logophoric pronouns is illustrated by the example in which the logophoric pronoun occurs in the complement of a speech predicate. (63) is data from Ewe:

(63) a. Kofi_i be yè_i-dzo
Kofi say LOG-leave 'Kofi$_i$ said that he$_{i/*k}$ left'

b. Kofi_i be e_k-dzo
Kofi say 3sg-leave 'Kofi$_i$ said that he/she$_{*i/k}$ left'

(Culy 1997: 847)

The logophoric pronoun *yè* and *Kofi* must be co-referential in (63a), and in (63b) *Kofi* and personal pronoun *e* must not be co-referential. Observing these facts, Culy (1997: 847) notes, "the difference between the logophoric pronoun and the personal pronoun is one not of point of view, but of reference". Culy (1994, 1997) further argues that logophoric pronouns are typically licensed by predicates, and in that case, they do not show point-of-view effects at all. The following examples prove clearly that the use of logophoric pronouns does not indicate point-of-view in a scope of licensing predicates (i.e. *believe* and *say*).[10]

(64) a. Kofi_i xɔ-e se be Ama_k gblɔ be $\text{yè}_{i/k}$-ɟu $\text{yè}_{i/k}$
Kofi receive-PRO hear that Ama say that log-beat log
'Kofi$_i$ believe that Ama$_k$ said that he$_i$ beat her$_k$' or
'Kofi$_i$ believed that Ama$_k$ said that she$_k$ beat him$_i$'

(Culy 1997: 850)

b. John_i claimed that Bill_k said that $\text{he}_{i/k}$ saw a snake near $\text{him}_{i/k}$.

Recall the constraint for point-of-view noted above. If logophoric pronouns are indeed point-of-view designators, multiple logophoric pronouns in a discourse should be excluded. Nevertheless, (64a) is grammatical. Thus, logophoric pronouns should not be treated as point-of-view indicators, but indirect-discourse forms primarily. The English sentence (64b) shows the same property.[11]

In English, of course, morphologically distinct logophoric pronouns do not exist. As Hirose (1997) points out, in English, personal pronouns can be used for marking of

[9] This is originally from Clements (1975), cited by Culy (1997).
[10] According to Culy (1994), the logophoricity licensing predicates form an implicational scale, which explains the cross-linguistic logophoric marking. The speech verbs are in the higher most position in this scale, which implies they are always logophoricity licensing predicates across languages.
[11] In English, the point-of-view effect is seen in reflexives. Cf. Cantrall (1974), Kuno (1987), Reinhart and Reuland (1993), Zribi-Hertz (1989) , van Hoek (1995, 1997), among others.

logophoricity as their secondary function.[12] We claim later that in English the effect of logophoricity is observed in the difference of grammaticality. A similar paradigm as in English is reported for Adioukrou, a Kwa language of Côte d'Ivoire.

(65) a. li_i dad eke $in_{i/k}$ im Dabu
3sFP said^AC that 3sRP went^AC Dabou
'He_i said that $he_{i/k}$ went to Dabou' (Culy 1997: 856)
b. $John_i$ said that $he_{i/k}$ was the champ.

The above discussion shows that logophoricity is licensed by predicates. On the other hand, the point-of-view effect is determined not by the choice of verbs, but by the speaker's attitude to the conception. To illustrate this, consider the following prototypical sentences that show point-of-view effect:

(66) Tom loves Mary.
(67) a. *Tom* loves *his* mother.
b. *Mary*'s son loves *her*.

Assume that (66) is a neutral description of an event, and Tom and Mary are in a parent-child relation. The corresponding (67a) and (67b) are viewed from Tom's point of view and Mary's, respectively. In these cases, the speaker chooses freely which participant's point of view he/she takes. This is not the case in logophoric context such as (61) above. The predicate determines which point-of-view should be taken.

Now we will turn back to the contrast in (61) and (62) above. As noted in the previous sections, the following sentences are both allowed with the intended co-reference.

(68) That *he* would be elected was anticipated by *John*.
(69) That *he* had an appointment at two was forgotten by *John*.

While (62) and (69) are both grammatical, (61) and (68) show a sharp contrast. The former type shows the same property as the point-of-view effect; that is, it allows two possible points-of-view. On the other hand, the latter type allows only one. This difference is what we have seen in the difference of logophoricity and point-of-view above. We should treat only the former type as point-of-view effect. We agree with Kuno (1972) in that the pronoun in (68) is a product of indirect discourse formation.

Having established the difference between logophoricity and point-of-view, and

[12] For a detailed and insightful discussion of the topic, see Hirose (1997). He distinguishes "public self" and "private self" and argues that while in Japanese there is an expression for private self, *zibun*, in English, there is no such expression, thus, personal pronouns bear secondarily that function.

their relevance to the data in question, we now turn to the problem of how to distinguish them in a theory. Particularly important is the problem that while both *John*s in (68) and (69) seem to represent logophoric subjects (i.e. the person whose saying or feeling is reported), one shows logophoric effect and the other does not. To deal with this problem, we have to establish representations for both types of sentences with more elaborate structure.

In the next subsection, we provide the representation for factive verbs and speech verbs. We also discuss the problem of how to treat point-of-view and logophoricity in the theory.

4.2 Factives and Speech Verbs

Let us begin with the observation of data. Consider again the following sentences:

(70) a. That *Mary* was sick bothered *her*.
b. That *she* was sick bothered *Mary*.
(71) a.? That *John* was sick was denied by *him*.
b. That *he* was sick was denied by *John*. (Kuno 1972: 162)
(72) a.* That *John* was the best boxer in the world was claimed by *him*.
b. That *he* was the best boxer in the world was claimed by *John*. (Ibid.)
(73) a.* The remark that *Jason* was guilty was made by *him*.
b. The remark that *he* was guilty was made by *Jason*.

In (70)-(71), both forward and backward pronominalizations are allowed. On the other hand, in (72)-(73), they only allow backward pronominalization. The verbs that show the same paradigm as (70)-(71) are listed in (74). (75) is the list of verbs that show the paradigm of (72)-(73).

(74) *bother, deny*[13], *forget, realize, regret*, and *surprise* etc.
(75) *anticipate, claim, expect, say*, and *suppose* etc.

Note here that the verbs in (74) are so-called **factive** predicates, except for *deny* (see footnote 13), and the verbs in (75) are **speech verbs**. That is, the possibility of forward pronominalization in the syntactic schema given in (76) seems to depend on the semantic class of verbs.

(76) [That NP_1 ...] V NP_2

[13] Although *deny* is usually grouped into non-factives, I classify this as a factive here. The reason will be discussed in the next page.

The above observation implies that we need to explore the difference between factives and speech verbs, and that the correct description of these semantic nature will lead us to a correct prediction for the possibility of pronominalization.

It has been pointed out that the differences between factives and speech verbs (or non-factives/strong assertive verbs) lie in the status of the content of the complement (Kiparsky and Kiparsky 1970 and Hooper 1975). In factives, the speaker of a sentence presupposes the truth of the embedded proposition.

(77) John regrets that Mary is married.

In (77), the speaker takes for granted that Mary is married or at least she treats the proposition as already given information and as if everyone knows it. Given the situation that the proposition that Mary is not married is true and the speaker who utters (77) knows it, then (77) would sound anomalous.

Speech verbs, on the other hand, do not impose this presupposition requirement. The speaker does not commit himself to the truth of the embedded proposition. Consider (78):

(78) John claims that Mary is married.

In this case, the speaker does not presuppose the truth of the embedded proposition, rather he reports John's claim. This is proved by the fact that a sentence such as "*but actually she is single*" can follow (78).[14]

The difference between facitves and speech verbs thus can be reduced to the difference in the status of complement clause in discourse. The complement clause of a factive predicate is true not only in the reality of subject's referent, but also in the speaker's reality. On the other hand, in the reported speech, the information in the complement clause may be true only in the subject's reality.

Let us, for a moment, consider the problem raised in footnote 13. The verb *deny* is usually categorized into the assertive (i.e. non-factive) predicates. Nevertheless, it shares a characteristic with factives in that the information described in the embedded proposition has been already given. Let us consider the next example.[15]

(79) Osaka Gov. Yokoyama "Knock" denied (the rumor) that he molested a female campaign aide.

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[14] One obvious exception to the generalization is the case where the subject of the verb is *I*.

(i) # I claim that Mary is married, but actually she is single.

This sentence may sound like the utterance of a schizophrenic. I exclude from discussion here assertive predicates with first person pronoun subject.

[15] I thank Hatsutani Tomoko for pointing out to me this example.

Suppose that the speaker who utters (79) is one of the supporters of the governor. Then he may not believe charge of the governor's molestation. I resolve this apparent discrepancy between factives and *deny* by assuming that in the verb group (74), the embedded proposition must be satisfied at time t, which is prior to the utterance time t_0. This characterization allows *deny* to be grouped into the same group as factives.

We now propose the conditions and actions for the interpretation of factives and speech verbs. Assume that P and Q are propositions. Then we have the following rules for factives and speech verbs.

(80) Factives

Conditions: S0 | X "$V_{factive}$ that" P

? S0 | P

Actions: create a space S1 and copy P to S1 via *f*

S0 | X $V_{factive}$ that [|S1|]

S1 | *f* (P) = P'

(81) Speech verbs

Conditions: S0 | X "V_{speech} that" Q

Actions: create a space S2

S0 | X V_{speech} that [|S2|]

S2 | Q

In (80), "?" indicates the precondition for the factives. Precisely speaking, P in (80) is inherited from the previously established space. In factives, the proposition P is copied onto the newly created space S1. The mapping between the two spaces is operated by a trans-spatial function *f*. In the case of speech verbs, the proposition Q is directly introduced into space S2.

In the above rules, there is no device to represent the holder of the embedded information. It is important here to represent them explicitly in the space configurations.[16] For this purpose, we will introduce two notions of discourse role, that is, SPEAKER and LOGOPHOR. SPEAKER is the role for reporting speaker, and LOGOPHOR is the role for the person whose speech and thought are reported. We subsume so-called "experiencer" of factives under the role LOGOPHOR. We now replace (80) and (81) with the following rules.

[16] Cutrer (1994) also posits the strong VIEWPOINT space for speech verbs, which constructs speech domain. This space is a very abstract construct in nature, which has no element in it. The introduction of discourse role LOGOPHOR is in the same vein as the strong VIEWPOINT space, but we differ in that I posit it as one of the roles. Our formulation may have some advantages over Cutrer's. Given the role LOGOPHOR, we can preserve the nature of VIEWPOINT as a point-of-view, and distinguish the notions of point-of-view and logophoricity. Furthermore, we can avoid the ad hoc feature "strong" to the spaces. See also Sells (1987),

(82) Factives

Conditions:	S0 | X "$V_{factive}$ that" P
?	S0 | P
Actions:	create a space S1
	S0 | X $V_{factive}$ that [|S1|]
	S0 | ● SP
	S1 | f (P) = P'
	S1 | ● LOG
	S1 | X = LOG

(83) Speech verbs

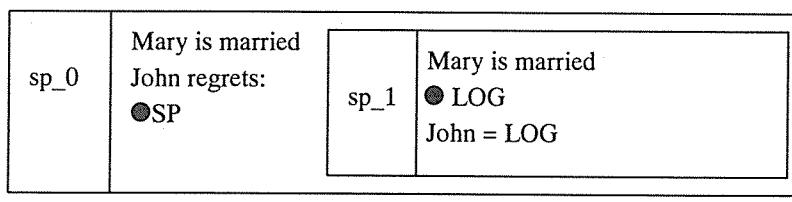
Conditions:	S0 | X "V_{speech} that" Q
Actions:	S0 | X V_{speech} that [|S2|]
	S0 | ● SP
	S2 | Q
	S2 | ● LOG
	S2 | X= LOG

Let us now define a "logophoric domain".

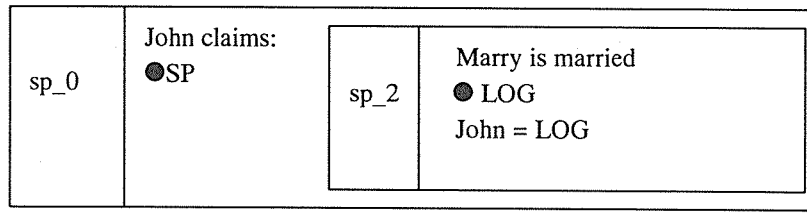
(84) A space is in a "logophoric domain" if it contains the role LOGOPHOR in the space.

The space configurations of factives and speech verbs are diagrammatically represented in (85) and (86), respectively.

(85) Factives
John regrets that Mary is married.



(86) Speech verbs
John claims that Mary is married.



Recall that the newly created spaces are always serving as FOCUS. It is true of speech verbs, but we have to provide some explanation in the case of factives. Factive predicates impose presupposition requirement, as noted above. The presupposed information is usually not important in the discourse. What is important is the attitude or reaction of a subject referent to the proposition. This property of factives is witnessed by the fact that the complement clauses are never the focus of negation and question (Hooper 1975).

(87) a. John doesn't regret that Mary is married.
b. Does John regret that Mary is married?

Thus, we posit that the FOCUS of the factives is in sp_0, where the event encoded by a main verb takes place.

With regard to the VIEWPOINT, there are two possibilities: sp_0 and the new spaces. This is ensured by the following examples. First, observe the ambiguity of the indefinite in the next sentence.

(88) John regrets that Mary married a millionaire.

As argued above (section 3.3), the ambiguity of noun phrases is explained by the different locus of VIEWPOINT space. The indefinite *a millionaire* can be read either as specific or non-specific in (87). The access path from speaker's reality (i.e. sp_0) to the sp_1 induces specific reading. The direct access from the sp_1 induces non-specific reading. Note that this fact also motivates the partitioning of information into different spaces in factives, even though the entailment relation holds without the main verb (see section 3.2). The similar observation can be made in the case of speech verbs. In the following example, the verb of speech shows an ambiguity between *de dicto* reading and *de re* reading for the definite noun phrase.[17]

[17] This example is cited from the comments by S. Sakahara in the Japanese translation of *Mental Spaces* (Hakusuisha, 1996, p. 236).

(89) Willy said that he had seen the woman who lives at 219 Main Street.

We find that in (89), two readings for the definite noun phrase are available: For one reading, the speaker faithfully reports the words of Willy, so the woman actually may not live at 219 Main street (*de dicto*). For another reading, Willy actually says, "I saw Harriet Robinowitz", and then the speaker reports it in his own words (*de re*). In the former case, the speaker's reality space works as the VIEWPOINT, and in the latter, M, Willy's reality space, is both FOCUS and VIEWPOINT. As these facts indicate, VIEWPOINT may shift to both sp_0 and sp_2.

To summarize, the differences between factives and speech verbs are: (i) the content of a complement clause holds in both sp_0 and the daughter space sp_1 in factives, while in speech verbs, it holds only in sp_2, (ii) the role LOGOPHOR is introduced directly into sp_2 in speech verbs, while it is introduced as a result of the application of trans-spatial connector F in factives.

4.3 Summary

In this chapter, we first developed the discussion that point-of-view and logophoricity should be distinguished. We showed that logophoricity is licensed by predicates, and the data van Hoek treats as a point-of-view effect are actually the indirect discourse use of pronouns. In 4.2, we divided verbs into two classes, which are called factives and speech verbs. Factive and speech verbs are different in that while in the former, the content of the complement may be true in both a speaker's reality and an experiencer's, in the latter, it is true only in the LOGOPHOR's space (i.e. logophoric domain). According to these observations and characterizations, the representations of these verbs were proposed, and diagrammatically depicted in (85) and (86).

With these characterizations, we will turn to the explanation of pronominal anaphora phenomena in the next chapter.

5 THE PROCESSING OF PRONOMINAL ANAPHORA

The representations of factives and speech verbs just proposed provide us with the resolution to the problems presented in section 2. The proposed representations are the constructs of the level C, which is distinct from linguistic expressions. We propose that the constraint governing the interpretation of pronouns is operated at this level.

5.1 The Interpretation of Pronouns and A Constraint of Logophoric Marking

In the mental representation, NPs are mapped as discourse referents. The NPs are distinguished whether they are indefinites or definites. Indefinites presuppose that the referent has not been introduced in the relevant discourse, and definites presuppose the already introduced referent. Pronouns are clearly grouped into definites, and thus, they presuppose the existence of the referent at the point of the introduction into the discourse. The main difference between pronouns and definites is that pronouns do not have their own description. They only refer to some element in the discourse. We will keep this difference explicitly in the mental representation of discourse, because a definite noun has to search for its 'antecedent' that matches its description, but a pronoun does not require that sort of matching.

We have the following rule for the interpretation of pronouns.

(90) Conditions: S0 | X "($_{PRON}$ W)" Y
? S0 | U is W

Actions: S0 | X U Y

This constructive rule is applied to both pronouns that have definite antecedents, and ones that have indefinite antecedents. This rule explains the following contrast which is observed in 3.3.

(91) a. Mary wants to marry *a millionaire*.
b. *He* will be a fat man.
c.**He* is a fat man.

Assume that the indefinite is interpreted as referring to a non-specific person. In this case, the referent for *he* in (91c) is not established in space R, for the element corresponding to *a millionaire* is introduced into Mary's wish space in which the description of the man is true. Therefore, it does not fulfill the requirement of the second condition of the rule (90). However, this is not true of definites. Consider the following sentences:

(92) a. Oedipus believes he will marry *his mother*.
b. Actually, *she* is not his mother, though.

Suppose that the above sentence accurately reports Oedipus's thought. That is, it is equivalent to saying that *Oedipus believes he will marry Xanthippe*. Now, in this context, *she* in (92b) can refer to *his mother* from the preceding discourse, even though the sentence reports what Oedipus does not think, which is shown by the use of *actually*. This is because the accommodation of existential presupposition can be made easily across spaces in the definites. We posit in the case of definites that

pronouns can refer back to the elements in other spaces by introducing them through a connector.

Now, turn our discussion back to logophoricity. We propose the following constraint for logophoric marking in English:

(93) A constraint for logophoric marking[18]
An element in a logophoric domain must not be a full noun phrase when the element occupying the role LOGOPHOR and the element in logophoric domain co-refer.

Observe the simple examples to which this constraint may be applied.

(94) a. *John* said that *he* was the champ.
b.* *He* said that *John* was the champ.
(95) a. *John* was surprised that *he* had cancer.
b.* *He* was surprised that *John* had cancer.

In the above examples, the value that fills the role LOGOPHOR is *John* and its logophoric domain is *that*-clause complement. Note here that proper names are semantically definite and we cannot attribute the ungrammaticality of (b) sentences to the non-satisfaction of the precondition of (90). We can accommodate antecedents as we can do in the definites.

A new problem emerges here, however. Why does the contrast between factives and speech verbs appear in a particular construction, while in the construction above, they show a similar acceptability with regard to a pronominal reference? This fact indicates that syntactic information may be useful to the understanding of pronouns in discourse representations. Actually, this is not the only case that syntactic information is useful in mental representation. The following examples show this:

(96) a. *Mary* found a scratch in *her* picture.
b.* *She* found a scratch in *Mary*'s picture.

If we assume subjects are in 'higher' positions than other elements in the sentence, and the pronouns cannot co-refer with elements that are 'lower' in the hierarchy, the contrast in (96a) and (96b) can be explained. The following examples ensure that this contrast is due to the hierarchy of elements in the sentence.

(97) a. In *her* picture, *Mary* found a scratch.
b.* In *Mary*'s picture, *she* found a scratch.

However, this contrast seems to be observed only when the elements are in the same

[18] There is an exception to this constraint, as pointed out by H. Imoto. When noun phrases are in role reading as in the declaration, the violation of (93) is permitted.
(i) *I* declare that *the king* is the sovereign of the nation.
In this example, *the king* is considered to refer to the role, rather than its value.

space. Consider the next paradigm:

(98) a. *John* is riding a horse in *his* picture.
b.* *He* is riding a horse in *John*'s picture.
(99) a. In *his* picture, *John* is riding a horse.
b. In *John*'s picture, *he* is riding a horse.

As we discussed in section 3.3 above, the spatial modifiers in (96) and (97) do not serve as space builders. On the other hand, the spatial modifiers in (98) and (99) construct new spaces. In this case, only (98b) is not permitted. This paradigm is the same as the one observed in the factive predicates.

(100) a. *John* was surprised that *he* had cancer.
b.* *He* was surprised that *John* had cancer.
(101) a. That *John* had cancer surprised *him*.
b. That *he* had cancer surprised *John*.

With speech verbs, only backward pronominalization is allowed.

(102) a.* That *John* was the champ was claimed by *him*.
b. That *he* was the champ was claimed by *John*.

We conclude from these facts that the principle governing the accessibilities of (94), (101), and (102) is our constraint for logophoric marking (93), and the contrast between (95a) and (95b) or (100a) and (100b) is reduced to the syntactic or linear configuration of the sentences.

5.2 Factives

5.2.1 Canonical Cases Let us start with factives. The interpretation rule for factives is repeated here as (103).

(103) Factives

Conditions:	S0 | X "$V_{factive}$ that" P
?	S0 | P
Actions:	create a space S1
	S0 | X $V_{factive}$ that [|S1|]
	S0 | ● SP
	S1 | f(P) = P'
	S1 | ● LOG
	S1 | X = LOG

According to the rule, the following example is mapped onto the representation in

(105).

(104) That *John* was sick bothered *him*.
(105) sp_0 | He was bothered : [|sp_1|]
sp_0 | ● person_1 = he
sp_0 | ● SP
sp_0 | ● person_2 = John
sp_0 | person_2 was sick
sp_1 | *f* (person_2 was sick) =(person_2 was sick) '
sp_1 | ● LOG
sp_1 | person_1 = LOG

Recall that we have two possibilities with regard to the choice of VIEWPOINT space. The VIEWPOINT space is the space from which the access path is taken. First, let us consider when the VIEWPOINT space is sp_0. We concentrate on the interpretation of pronouns. The interpretation rule for pronouns requires that an antecedent of a pronoun be in the space to which the pronoun is introduced. The intended antecedent is already in sp_0, by virtue of being factive predicate. Thus, we can get the following. We posit the specific type of identity function *g* that takes a pronominal referent as its input and has full nouns as its output.

(106) sp_0 | ●person_1 = he
sp_0 | ● person_2 = John
sp_0 | *g* (person_1) = person_2

Now, we have established the referent of *he*, and we can replace person_1 with person_2 in sp_0, deleting the distinction between pronouns and full nouns. Note that the constraint (93) is not violated here.

Let us turn to the case where the VIEWPOINT is in sp_1:

(107) sp_1 | ● person_1 = he
sp_1 | ● LOG
sp_1 | ● person_1 = LOG
sp_1 | ● person_2 = John
sp_1 | *g* (person_1) = person_2

Note that in this case, the role LOG is filled by the referent of *him*, and it is identified with *John*. sp_1 is the logophoric domain of the referent of *him/John*, and therefore, this interpretation procedure induces the violation of (93). Thus, the former interpretation procedure is taken in this case.

Let us now consider (108):

(108) That *he* was sick bothered *John*.

The mental representation of (108) is like this:

(109) sp_0 | John was bothered that : [| sp_2|]
sp_0 | ● person_1 = John
sp_0 | ● SP
sp_0 | ●person_2 = he
sp_0 | person_2 was sick
sp_1 | *f* (person_2 was sick) = (person_2 was sick)'
sp_1 | ● LOG
sp_1 | John = LOG

First, let us consider when the VIEWPOINT is attributed to sp_0:

(110) sp_0 | ● person_1 = John
sp_0 | ● person_2 = he
sp_0 | *g* (person_2) = person_1

This is allowed, as we have seen above. Consider now when the VIEWPOINT is in sp_1.

(111) sp_1 | ● person_1 = John
sp_1 | ● LOG
sp_1 | John = LOG
sp_1 | ● person_2 = he
sp_1 | *g* (person_2) = person_1

In this case, there is no violation of (93), for the element that fills the role LOG is *John*, which is not a pronoun, but a full noun.

Note here that the present analysis explains the difference of meaning suggested by Kuno (1972). Recall his observation reviewed in section 2.2. He points out that while sentences like (104) are described from the speaker's point-of-view, sentences like (108) are interpreted to be an internal feeling of the sentence participant. In the present analysis, the difference of meaning can be attributed to the difference of the space in which the pronoun has its antecedent. Recall that in forward pronominalization and backward pronominalization that have the VIEWPOINT in sp_0, the pronoun is interpreted in the speaker's reality space. The former corresponds to "the speaker's point-of-view" reading. On the other hand, backward pronominalization that has the VIEWPOINT in sp_1, is interpreted in the logophor's space (i.e. logophoric domain). This corresponds to "the experiencer's point-of-view" reading.

In the next section, we provide further evidence that supports the present analysis with some specification of context.

5.2.2 The Effect of the Context Let us, for a moment, consider the possible processing strategies described above. In (104), only the option that sp_0 is the

VIEWPOINT is allowed, and in (108), it allows both options. Therefore, our analysis predicts that forward pronominalization is allowed only from the speaker's point-of-view. If the content of the clause cannot be accessed by the speaker, the present analysis predicts that only backward pronominalization is allowed.

To see that this prediction is borne out, consider the following sentences:

(112) a.??That *John* was secretly in love with Mary worried *him*
b. That *he* was secretly in love with Mary worried *John*.
(Kuno 1972: 165)

As observed by Kuno (1972), in the above case, forward pronominalization is less acceptable.[19] If we assume that the adverb *secretly* functions as setting the VIEWPOINT not to sp_0, the anomaly of (112a) is explained naturally.

The same explanation goes to the example presented by van Hoek (1997). In the context given in (35), repeated as (113) here, the forward pronominalization is reported to be anomalous.

(113) John took a moment to gather his nerve before opening the envelope from the testing center. This had been the longest week of his life, but now, with the results in hand, he found it easy to wait a few more minutes before finding out. The idea that John might have AIDS was terrifying.
(van Hoek 1997: 207)

The preceding discourse requires the reader to take John's point-of-view, i.e. the VIEWPOINT is in sp_1. The analysis above states that the forward pronominalization is allowed only when the VIEWPOINT space is in sp_0, and thus the anomaly occurs.

Next, let us see the effect of modal adverbs (see section 2.2).

(114) a.* Learning that *John* was sick bothered *him*. (Kuno 1972: 168)
b. Knowing that *John* is perfect naturally pleases *him*.
(Bolinger 1979: 296)

(115) a.* It surprises *him* that *John* is so well liked.
b. It obviously surprises *him* that *John* is so well liked.
(Bolinger 1979: 290)

We assume that the effect of modal adverbs in the processing of spaces is as follows.[20]

[19] (112) are bad in colloquial speech. Kuno reports that these sentences are acceptable in narrative discourse.
[20] For a detailed discussion of modal adverbs, see Bellert (1977), Jackendoff (1972) and Nakamura (1997).

(116) Modal adverbs such as *naturally*, *obviously*, *evidently* and *apparently* indicate that the FOCUS and VIEWPOINT is in a speaker's reality space, and inactivate the reality space of an experiencer.

The modal adverbs have the reverse function of the context presented above. Note that the unrealized subjects of (114) are understood to be *John*. For gerundive constructions with factive predicates, we posit that they are mapped onto the John's reality space. Thus, example (114) is unacceptable for the same reason as the second option of forward pronominalization in factives. On the other hand, with the modal adverb *naturally*, it changes the function of the sp_0. It serves as the VIEWPOINT, and thus we get the acceptable sentence (114b). Note that we can apply this analysis to the sentences with modal auxiliary *should*. Recall that the modal auxiliary *should* does not affect the grammaticality. If we assume that the function of the auxiliary is the same as the modal adverbs, this is what our theory predicts.

We have seen that the present analysis correctly predicts that with factive predicates, the co-reference option is variable according to the choice of VIEWPOINT, which is affected by the context.

5.3 Speech Verbs

Let us now turn to the case with speech verbs. Consider the mechanism that produces the following contrast.

(117) a.* That *John* was the champ was claimed by *him*.
b. That *he* was the champ was claimed by *John*.

The constructive rule of speech verbs is repeated here as (118).

(118) Speech verbs
Conditions: S0 | X "V_{speech} that" Q

Actions: S0 | X V_{speech} that [|S2|]
S0 | ● SP
S2 | Q
S2 | ● LOG
S2 | X= LOG

Let us begin with (117a). The discourse structure of (117a) is represented below.

(119) sp_0 | He claimed: [|sp_2|]
sp_0 | ●SP

sp_0 | ● person_5 = he
sp_2 | ● person_6 = John
sp_2 | person_6 was the champ
sp_2 | ● LOG
sp_2 | ● person_5 = LOG

Consider first the case where the VIEWPOINT is in sp_0. In sp_0, there is no antecedent for the pronoun *he*, and thus we have to accommodate its antecedent. This is done by introduction of the pronoun *he* into the sp_2 by identity connector. We interpret the pronoun at this stage, and we get the following representation.

(120) sp_0 | ● person_5 = he
sp_2 | *I* (person_5) = person_5'
sp_2 | ● person_6 = John
sp_2 | *g*(person_5') = person_6

Note that the filler of the LOG is pronoun *he*, and this is the violation of (93).

Now, let us note that the second possibility also fails to be successfully processed. This time the VIEWPOINT is attributed to sp_2. The configuration below is again the violation of (93).

(121) sp_2 | ● person_6 = John
sp_2 | ● LOG
sp_2 | ● person_5 = LOG
sp_2 | *g* (person_5) = person 6

Thus, in this case, both of the procedures are not allowed and the sentence becomes unacceptable. We can conclude that in the case of speech verbs, the VIEWPOINT space plays no role in determining the acceptability of co-reference between full NPs and pronoun.

Let us turn to the backward anaphora case then.

(122) sp_0 | John claimed: [|sp_2|]
sp_0 | ● SP
sp_0 | ● person_5 = John
sp_2 | ● person_6 = he
sp_2 | person_6 was the champ
sp_2 | ● LOG
sp_2 | ● person_5 = LOG

In this case, the pronoun and full noun are reversed. In sp_2, the pronoun *he* has to accommodate its antecedent, *John*. The identity connector introduces *John* from the

sp_0, and the pronoun-antecedent relation is established. Note that the choice of the VIEWPOINT space plays no role here, either.

As we have seen so far, the VIEWPOINT space plays no role in the acceptability of pronominalization. This is a natural consequence of distinguishing point-of-view (i.e. VIEWPOINT) and logophoricity. That is, in a logophoric marking system, a predicate licenses the grammaticality of logophors. We consider that the difference between (104) and (108) is a reflection of difference of point-of-view, and the difference between (117a) and (117b) is a reflection of logophoric marking.

5.4 Summary

We have discussed the processing of the pronominal anaphora in factives and speech verbs. We have proposed the constraint for logophoric marking (93) that prohibits the occurrence of a filler of LOGOPHOR as a pronoun, being co-referential with an element in a logophoric domain. Our mental representation combined with the constraint can explain the co-reference facts correctly. Our analysis predicts further that in factives, availability of co-reference is affected by contextual information, for it is a reflection of point-of-view effect. We have seen in 5.2.2 that this contextual effect is brought about by modal adverbs and a modal auxiliary. On the other hand, speech verbs do not show point-of-view effect, and they are governed by logophoricity. Thus, with these verbs, forward pronominalization is always blocked under the constraint (93).

6 CONCLUSION

This paper treated the logophoricity and point-of-view effect in English in terms of Mental Space Theory. We discussed the partition of information in factives and speech verbs, and the condition on the possible co-reference option between pronouns and full NPs in the contexts with these verbs.

One of our claims was that to describe properly and explain the data presented in section 1, it is not sufficient to refer only to the structural configuration (see 2.1). We agreed with the idea that the semantic/pragmatic aspect has something to do with the phenomenon.

Our starting point of discussion was that the notions of point-of-view and logophoricity should be distinguished. Point-of-view is, by definition, selected by a speaker freely, while a logophor is licensed by predicates (see 4.1). The prototypical licensing predicates are speech verbs. In this regard, we agreed with the analysis presented by Kuno (1972), and not with van Hoek (1997) (see 2.2 and 2.3). Although Kuno's analysis was very insightful, and seems plausible, it did not explain the contextual effects properly (see 2.2).

We generalized that the possibility of forward/backward pronominalization depends

on the semantic class of verbs, that is, factives and speech verbs (or "strong assertives"). We show that this distinction is closely related to the distinction of point-of-view and logophoricity noted above. Thus, one of our labors in section 4 was to present the representations of these verbs in terms of Mental Space Theory introduced in section 3. We introduced a new notion, discourse roles, which are called LOGOPHOR and SPEAKER. LOGOPHOR is a person whose speech and feeling are reported. To represent the point-of-view, we used the VIEWPOINT, which was proposed in the mental space theoretic approach to tense/aspect system by Cutrer (1994). This division of labor is a direct consequence of distinction of point-of-view and logophoricity, as claimed in 4.1.

We gave a more complicated space configuration to factives than speech verbs. The characteristic of factives was that the reality space of speaker R is connected by trans-spatial connector to that of experiencer's M, and thus, we can process the pronominal antecedent in space R, rather than M. On the other hand, the speech verbs directly construct the internal speaker's space, which includes the role LOGOPHOR. Then we have shown that the space configurations for each verb and the constraint proposed in chapter 5 lead us to the right prediction.

Our analysis has its advantage in that we can deal with the effect of modal adverbs by positing that these adverbs function to indicate the sentence belonging to the space R (, which bears VIEWPOINT). In mental space theoretic analysis, adverbs can serve as space builders, which not only introduce new spaces, but also indicate the FOCUS space and the VIEWPOINT space (in Dinsmore's term, contextualization cues). Thus, the present analysis, which can represent discourse notions and representations appropriately, explains uniformly the logophoricity and point-of-view effect on pronominal anaphora. If this theory is on the right track, we will be able to explain the logophoric phenomena cross-linguistically. I leave this task for future research.

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Eri Tanaka
2-1869-14, Higashiguminoki, Osakasayama
Osaka, 589-0012, Japan
eri-tana@rj8.so-net.ne.jp