

**The Syntax of Causality:
An Investigation of Event-Denoting Expressions
in English**

A Dissertation

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Chapter 1

Introduction

1. Purpose

Much research on argument realizations has been conducted under the assumption that the syntactic properties of individual words can be predicted from their lexical semantics (see Levin (1993), among many others). This assumption urges many researchers to investigate syntax-semantics interface phenomena and to attempt to find what grammatically relevant meanings are and how they associate individual words with certain syntactic realizations of the words. The general picture of this research program is explicitly summarized by Levin and Rappaport (2005:2) as follows:

- (1) One goal of a theory of argument realization is the isolation of the relevant components of meaning and the explication of their connection to the range of argument realization options.

Following this spirit, this thesis aims to explicate grammatically relevant meanings and to provide a linguistic theory with which they are appropriately associated.

2. Grammatically Relevant Meaning and Argument Realization

The question of what meanings are grammatically relevant has been extensively investigated in the literature. There are broadly three approaches to argument realizations (Levin and Rappaport (1995, 2005)): approaches based on thematic roles, aspect, and causality.

The first is concerned with thematic roles. In this approach, the information about

thematic roles, which is stored in lexical entries of each verb, crucially determines argument realizations of the verb (Fillmore (1968), Dowty (1991)). The thematic hierarchy hypothesis first proposed by Fillmore (1968) attempts to capture the correspondences between syntax and semantics based on thematic roles (cf. Jackendoff (1973), Gruber (1965)). The systematic one-to-one correspondence between syntactic positions of arguments and thematic roles is known as the Uniformity of Theta Assignment Hypothesis (UTAH) (Baker (1997)). The second is concerned with aspect. Tenny's (1994) Aspectual Interface Hypothesis assumes that only aspectual properties are syntactically visible. The final approach is based on causality and includes the Billiard-Ball Model in Langacker (1991), Force Dynamics in Talmy (1988), and Causal Chains in Croft (1991).

Although these three approaches to argument realizations appear to be based on distinct semantic components of different linguistic theories, these approaches are explicitly or implicitly concerned with the *event structure* concept. Event structure is an abstract construct that is composed of one or more than one event. The type of event structure is closely associated with the way of argument realizations. The thematic roles assumed in the thematic role-based approach are reinterpreted in terms of event structure. Rappaport and Levin (1988) and Hale and Keyser (1993, 2002) argue that the type of thematic role is determined by the positions in conceptual structures or lexical syntactic structures from which event structure is read off. Aspectual properties of verbs can also be captured by the structural properties of event structure. It is generally assumed that activity and state verbs are associated with a simple event structure, whereas accomplishment verbs are connected with a complex event structure (e.g., Grimshaw (1990), Pustejovsky (1991), Rappaport and Levin (1998)). Causality is a notion that presupposes the existence of multiple events in which one event causes another. Therefore, causality inherently involves the event structure concept.

Consequently, event structure is now considered a grammatically relevant component of

meaning in linguistic theories, although explicit exploitations of event structure in linguistic theories vary with researchers. In the following subsection, I introduce two broad approaches concerning event structure, in which the second approach can be further divided into two approaches. This thesis is based on the third approach.

3. Event Structure

There are two broad ways of exploiting event structure: the (lexical) conceptual approach and the neo-constructionist approach. The neo-constructionist approach is further divided into the absolute hierarchy approach and the relative hierarchy approach. We examine these three approaches in turn and this thesis adopts the third approach.

3.1. (Lexical) Conceptual Approach

The lexical conceptual approach asserts that event structure is situated on the (lexical) conceptual structures (e.g., Pinker (1989), Grimshaw (1990), Jackendoff (1990), Croft (1991), Pustejovsky (1991), Rappaport (1993), Carrier and Randall (1993), Levin and Rappaport (1995), Randall (2010)). Many researchers assume conceptual structures in the form of predicate decompositions, which are exemplified below:

- (3) a. John put the vase on the table.
 b. [_{Event} CAUSE (JOHN, [_{Event} GO ([_{Thing} VASE], [_{Path} ON ([_{Thing} TABLE]))])] (Jackendoff (1990))
- (4) [[x ACT] CAUSE [BECOME [y <STATE>]]] (Rappaport and Levin (1998))

The representations exemplified here are known as Lexical Conceptual Structures (LCSs) (or Lexical Semantic Representations (LSRs) (Levin and Rappaport (1995))). In (3), sentence (a)

is analyzed as in (b). The conceptual structure in (3b) includes CAUSE, which represents a causal relation between an agent and a (result) event. The same is true of (4), in which CAUSE connects one event to the other causally.

Conceptual structures independent of decompositional predicates are employed by Croft (1991), who proposes the following representations, known as Causal Chains:



The rightward arrows represent the direction of force, and the dots and letters (x, y and z) denote participants involved in a situation described by a given sentence. In this system, an event is defined by an interval between two participants, and two events are connected by a causal relation.

All the exploitation event structure introduced here share the idea that the concept of event structure (or causal relation) is situated on the (lexical) conceptual structures. The conceptual structure approach assumes some linking or mapping rules (Jackendoff (1990), Levin and Rappaport (1995), among others) that associate each argument position in conceptual structures with appropriate syntactic positions. In this approach, event structure is lexically specified in the lexicon, and it is the input of the operations in the syntax.

3.2. Neo-constructionist Approach

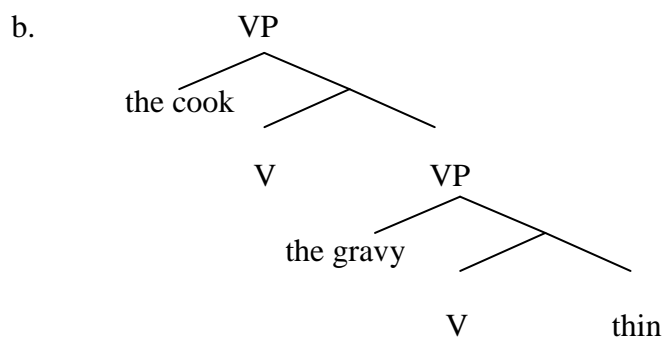
The neo-constructionist approach, on the other hand, assumes that event structure is the output of the operations in syntax, and it is under-specified in the lexicon. This approach originates in generative semantics (McCawley (1968)), and is later adopted in generative syntax (e.g.,

Hale and Keyser (1993), Arad (1998), Ritter and Rosen (1998), Ramchand (2008), Alexiadou (2010), Alexiadou and Schäfer (2006), Schäfer (2008)). In this thesis, we divide the neo-constructionist approach into two groups, the absolute hierarchy approach and the relative hierarchy approach.

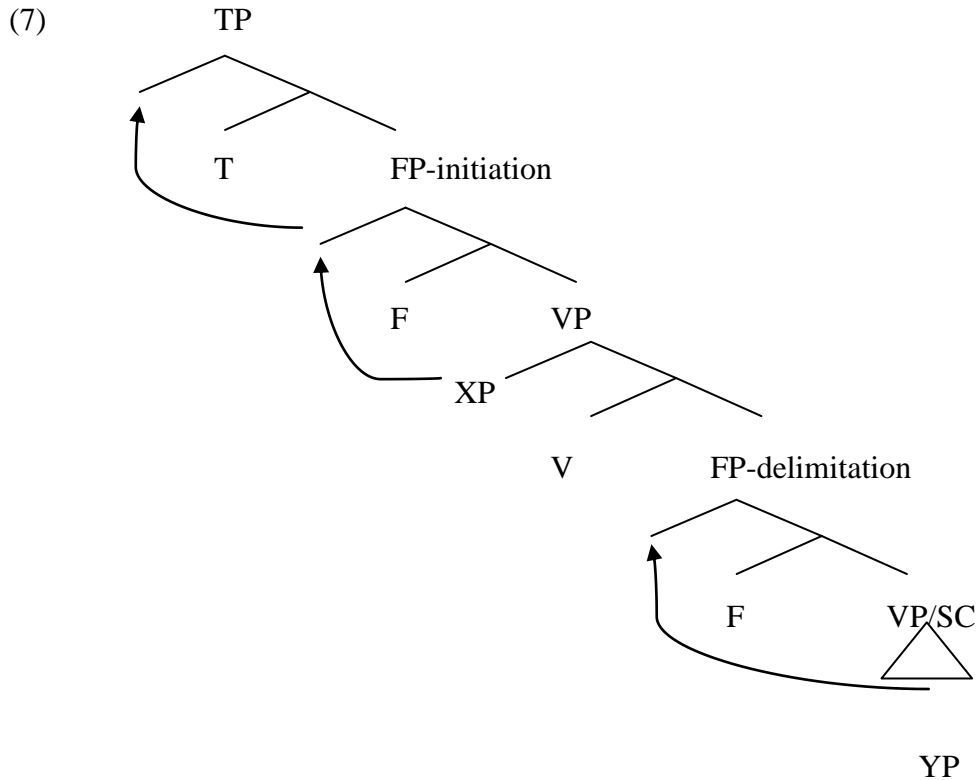
3.2.1. Absolute Hierarchy Approach

The absolute hierarchy approach is different from the relative hierarchy approach in the way cause is encoded in syntax. In the former approach, assuming the split VP hypothesis, cause is encoded in the upper VP or the upper functional phrase, and the result is associated with the lower VP or the lower functional phrase (Hale and Keyser (1993), Arad (1998), Ritter and Rosen (1998), etc.; cf. McCawley (1968), Ramchand (2008)).

(6) a. The cook thinned the gravy.



(Hale and Keyser (1993))



(Ritter and Rosen (1998))

Hale and Keyser (1993) argue that a causal relation between two events emerges from syntactic structures. In (6a), for example, it is argued that there is a causal relation between an action by the cook and an event of the gravy becoming thin. According to Hale and Keyser, the two events are represented by the upper and lower VPs, respectively, and this type of structure is interpreted as a causal relation between the two events. In (7), similarly, Ritter and Rosen (1998) assume that an argument that is situated in the specifier position of FP-initiation is interpreted as an initiator of an event (i.e., a causer of an event), and one that occupies the specifier position of the FP-delimiter is interpreted as a delimiter of the event (i.e., a causee of the event).¹ In this way, the FP-initiator and FP-delimiter denote a causing event and a result event, respectively.

We can summarize the approaches to event structure proposed by Hale and Keyser

¹ FP is the abbreviation for Functional Phrase.

(1993) and Ritter and Rosen (1998) as follows:

(8) a. Ritter and Rosen (1998) :

[_{FP1} CAUSE [_{FP2} RESULT]]

b. Hale and Keyser (1993) :

[_{VP1} CAUSE [_{VP2} RESULT]]

Both approaches share the intuition that, regardless of the distinction between lexical categories and functional categories, the upper VP or FP expresses the cause and the lower VP or FP the result. Note that the analyses shown here assume a one-to-one relationship between syntax and event structure in that the upper component corresponds to the cause, whereas the lower component corresponds to the result. Crucially, the upper and lower VPs and FPs are licensed by an argument that occupies their specifier position. In other words, an external argument and an internal argument function as a causer and causee, respectively.

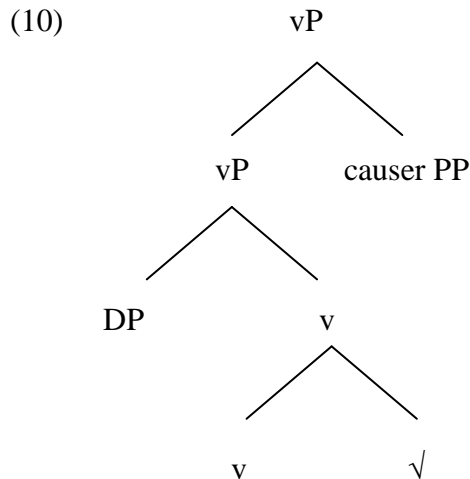
In this way, the absolute hierarchical approach assumes that the causal relation between two events is reflected in the asymmetric relation between subject and object.

3.2.2. Relative Hierarchy Approach

In addition to the subject, however, causer PPs that are adjoined syntactically higher than an object also denote a causing event. In the relative hierarchy approach, the relationship between syntax and event structure is relativized. In contrast to the absolute hierarchy approach, cause can be encoded in several functional heads in syntactic structures, and therefore, the relative hierarchy approach assumes a one-to-many relationship between event structure and syntax (e.g., Alexiadou (2010), Alexiadou and Schäfer (2006), Schäfer (2008)). Alexiadou and Schäfer (2006) assume a VP shell structure comprising two functional phrases

Voice P and vP. In the latter, v is a functional head that works as a verbalizer of $\sqrt{\text{ }}$.

(9) [(Voice) [vCAUS [Root + Theme]]] (Alexiadou and Schäfer (2006))



Alexiadou and Schäfer claim that Voice serves to introduce external argument, and the external argument refers to a cause or an agent. Transitive verbs have Voice P, licensing an external argument; unaccusative verbs lack it, and cannot introduce an external argument. The syntactic structure in (10) is that of an unaccusative verb. Note that vP may license cause via a causer PP:

(11) The window broke {from the pressure / from the explosion / from Will's banging}. (Alexiadou and Schäfer (2006:41))

In (11), the PPs *from the pressure*, *from the explosion*, and *from Will's banging* denote cause of the window's breaking. On the basis of these data, Alexiadou and Schäfer argue that unaccusative verbs, which lack Voice P (and an external argument), may license cause.

Note that the relative hierarchical approach allows more than one functional head that may license cause. In other words, a causal relation between two events is entirely determined

by a relative hierarchy between the two events. We can summarize Alexiadou and Schäfer's (2006) analysis as follows:

(12) [[vP *RESULT*] *CAUSE*]

Here, the causal relation between two events is represented by a relative hierarchy of the events. In the case of unaccusative verbs, cause may be a causer PP, as in (11). In the case of transitive verbs, on the other hand, cause may be denoted by an external argument. In both cases, the role of cause is played by an element that is relatively higher than the vP.

The relative hierarchy approach is superior to the absolute hierarchy approach in that the former does not need to stipulate that the upper VP or FP be associated with cause, whereas the lower one is connected to result. The causal relation between two events is a relative relation, and there is no reason to assume a strict one-to-one correspondence between syntax and event structure.

3.3. Interim Summary

In this subsection, we have seen three types of approaches to event structure. I believe that the ultimate adequacy of the (lexical) conceptual approach and neo-constructionist approach depends on empirical investigations, so I do not evaluate them here. In this thesis, I adopt the spirit of the relative hierarchy approach, although the details of my event structure theory depart from the approach of Alexiadou and Schäfer. The event structure theory that I propose in this thesis will be introduced in the next section.

4. Event Structure Layers

What is crucial in the relative hierarchy approach is that causal relation holds between an

event associated with an external argument and that associated with an internal argument as well as between an event denoted by a causer PP and that denoted by a result phrase, and so on. In this thesis, I provide further evidence for the idea that causal relation is determined by the relative hierarchy of event-denoting expressions in syntax through the investigations of various phenomena that are related to event-denoting expressions. I show in the following chapters that PPs, APs and particles that denote change of state, change of location, and means can be analyzed as event-denoting expressions.² We will see that these expressions can be associated with various syntactic positions, and at the same time, their distributions are systematically determined by the event structure system that I develop in this thesis. The enterprise of revealing the nature of event structure requires several theoretical assumptions, to which we turn in the rest of this section.

In this thesis, I follow Merchant's (2013) idea that the head that is responsible for voice alternations (i.e., Voice) is separated from the head that introduces an external argument (i.e., v).³ He argues for this idea on the basis of various compelling observations concerned with ellipsis in English and other languages, including Greek. His analysis shows that even Greek has Voice P above the split VP structure, contrary to the analysis provided by, e.g., Alexiadou and Schäfer. In addition, I propose that even unaccusative verbs contain vP, which is inactive

² Event-denoting expressions are those that denote dynamic eventuality as opposed to static eventuality (see Appendix in chapter 2). Whether an expression such as an AP or a PP qualifies as an event-denoting expression is determined by its interpretation. The PP *on the floor*, for example, can qualify as an event-denoting expression in (i), whereas it does not in (ii).

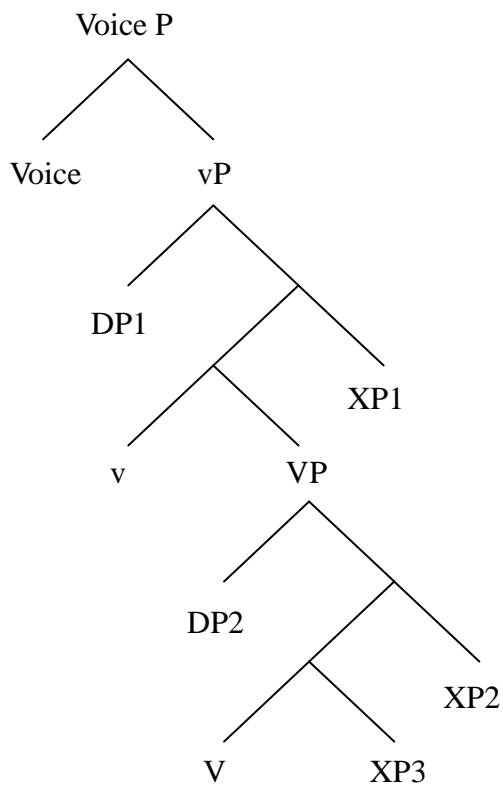
- (i) John broke the vase on the floor.
- (ii) On the floor, John broke the vase.

In (i), the PP can evoke the event in which the vase dropped onto the floor, which caused it to become broken. In this case, the PP evokes a dynamic eventuality. In (ii), on the other hand, this interpretation is untenable. Instead, (ii) means that the event in which John broke the vase occurred on the floor. In this case, the PP evokes a static eventuality. Of course, the static interpretation of the PP can hold in (i) as well, so (i) is ambiguous between the two interpretations. I suppose that the choice of the interpretation of the PP *on the floor* is determined by how we construe the sentence in (i).

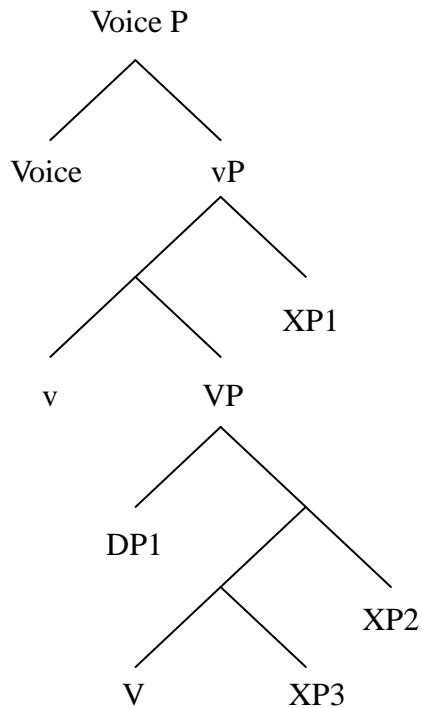
³ Kratzer (1996) and Pylkkänen (2008) argue that the Voice head introduces an external argument.

in that it does not introduce an external argument. Crucially, I assume that the causer PPs in (11), which are supposed to be associated with (lower) vP in Alexiadou and Schäfer's (2006) system, are licensed by the proposed upper vP of unaccusative verbs, although I agree that the lower VP may license a certain type of causer PP as well. In this thesis, for ease of exposition, I represent the split vP structure using the notations vP and VP, instead of upper vP and lower vP, and I omit the notation of \checkmark . Keeping these points in mind, the basic outlines of the structure of transitive and unaccusative verbs are as follows:

(13) Transitive verbs:



(14) Unaccusative verbs:



The XPs in the structures refer to (optional) adjuncts that denote an event.⁴ V may also express an event. In this way, the syntactic structures proposed here may potentially involve four events, and these events are hierarchically arranged as in (15).⁵ On the basis of the hierarchical arrangements of event structure, we call our analysis the hierarchical event structure analysis.

(15) [[[[V XP3] XP2] XP1]...]

XP1 is hierarchically higher than the rest of the events; XP2 is situated in a position lower than XP1 and higher than V and XP3; and V and XP3 are at the same height. The hierarchy in

⁴ From the theoretical viewpoint, it is possible to add more than three adjuncts that refer to an event in a VP structure, as long as they can be properly interpreted. In this thesis, I will restrict the number of XPs to at most three for ease of exposition.

⁵ I assume that an argument itself (whether external or internal) does not serve to express an event. Therefore, even in a natural cause subject sentence such as *The storm broke the window*, the external argument *the storm* is still considered as referring to an abstract entity, not an event.

(15), therefore, involves two types of hierarchical relations, the asymmetric relation and the non-asymmetric relation. Given the assumption that causal relations between events are fundamentally determined by their hierarchical relation, we can assume two types of relationships between events: causality (i.e., a causal relationship between events) and identity (i.e., a relationship between events without causality). In this thesis, I argue that the asymmetric relation and the non-asymmetric relation are defined by the syntactic relation of c-command in terms of first branching categories, and they are connected to causality and identity of events, respectively.

- (16) a. c-command relation (asymmetric relation): causality
- b. mutual c-command relation (non-asymmetric relation): identity

(17) Asymmetric Relation Condition (ARC):

For event-denoting elements A and B, the event of A causes the event of B iff A c-commands B. ($A > B$)

(18) Non-asymmetric Relation Condition (NRC):

For event-denoting elements A and B, the event of A and the event of B are identical iff A is in a local syntactic relation of mutual c-command with B. ($A = B$)

In (17), $A > B$ indicates that the event of A causes that of B. In (18), $A = B$ shows that A and B refer to an identical event.

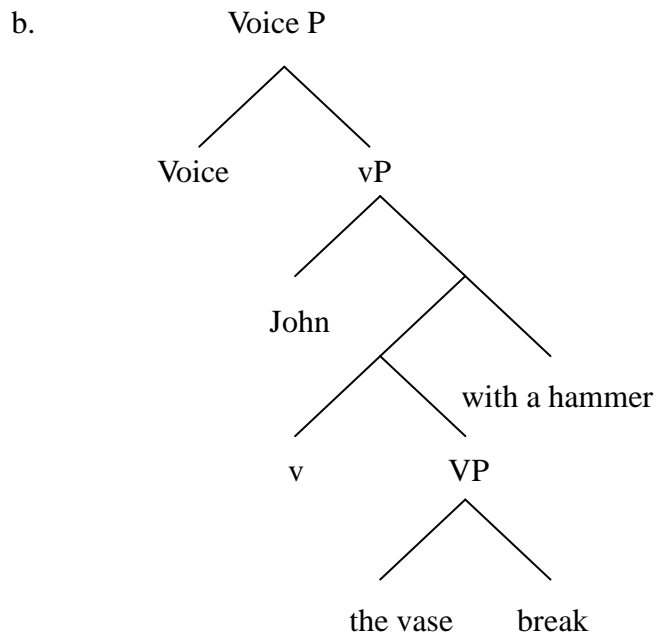
Assuming that V is the most deeply embedded event-denoting element, the event of V can either be caused by the event of another event-denoting element or be in an identical relation with it, but cannot cause it.

- (19) The event of V can either be caused by the event of another event-denoting element or be in an identical relation with it but cannot cause it. ($V \cong A$)

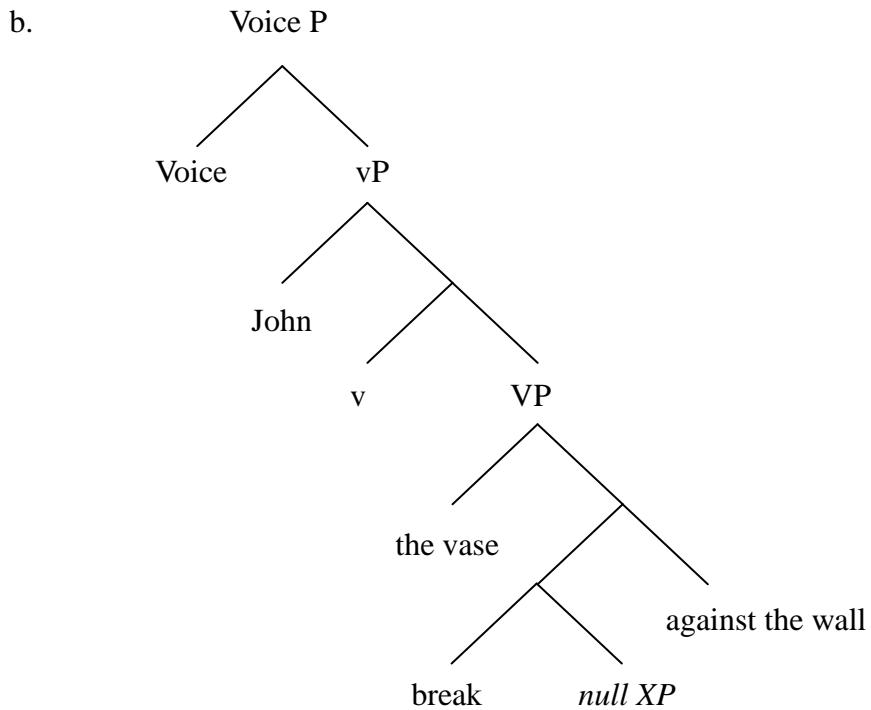
In (19), $V \cong A$ indicates that the event of V can either be caused by the event of A or be in an identical relation with it.

The two types of relationships, causality and identity, can be exemplified by the following sentences.

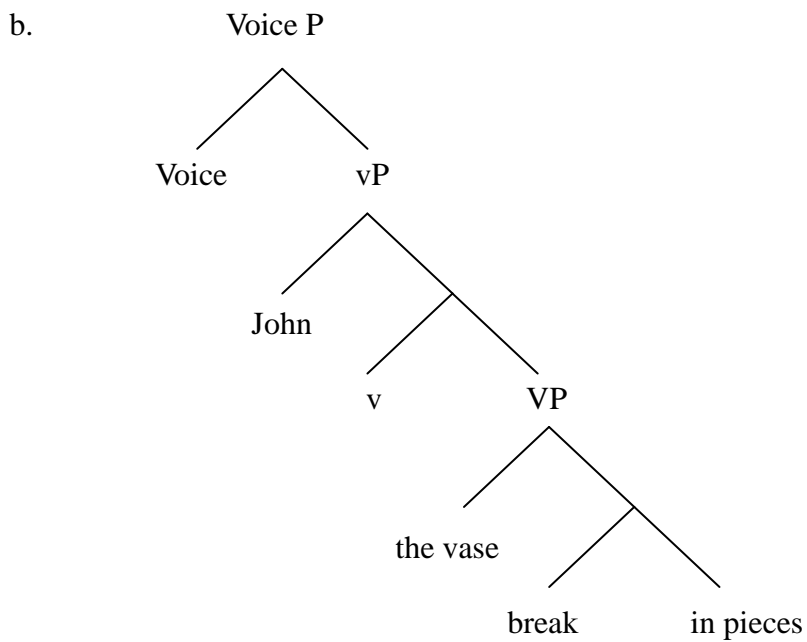
- (20) a. John broke the vase with a hammer.



(21) a. John broke the vase against the wall.



(22) a. John shattered the vase in pieces.



In the transitive sentence (20a), the XP1 and V in (13) correspond to the PP *with a hammer* and *break*, respectively. The PP designates an event in which John hit the vase with a hammer, and the verb designates an event in which the vase becomes broken. Note that the PP

c-commands V, and not vice versa, as in (20b). As a result, the PP is asymmetrically higher than V. This asymmetric relation is associated with a causal relation (cf. (16a)); consequently, the event denoted by the PP is interpreted as a causing event, which causes the event of the verb. In fact, this sentence can be paraphrased with the following sentence:

(23) John broke the vase by hitting it with a hammer. (cf. (20a))

In this paraphrase, the event in which John broke the vase is expressed in the main clause, which is interpreted as a result event; the event in which John hit the vase with a hammer is described by the subordinate clause introduced by the preposition *by*, which explicitly suggests that this event is interpreted as a causing event.

In sentence (21a), on the other hand, XP2 and V in (13) correspond to *against the wall* and *break*, respectively. As shown by the structure in (21b), the PP c-commands V, satisfying the asymmetric relation condition (ARC). Consequently, only the causality interpretation is available. I assume that the structure of the sentence in (21) includes null XP, which is not realized phonologically.⁶ The occurrence of the null XP allows a causal relation between the events evoked by the PP *against the wall* and the verb. In fact, the following paraphrase suggests there is a causal relation between the events evoked by the PP and V.

⁶ This assumption is supported by the strict locality of V and XP3.

- (i) a. Bill cooked the meat dry unsalted.
 - b. * Bill cooked the meat unsalted dry.
- (Emonds (1976:109))
- (ii) John broke the vase into pieces against the floor.

The XP3 *dry*, which serves to further specify the meaning of the verb *cook*, must be adjacent to the verb, as in (i), whereas the XP2 *against the wall* does not have to be adjacent to the verb *break*, as in (ii). The unacceptability of (ib) naturally follows because the intervention of the depictive unsalted between the verb and XP3 results in a syntactic structure in which the verb and XP3 are not in a local syntactic relation of mutual c-command. In the sentence in (ii), on the other hand, the intervention of the result phrase *into pieces* between the verb and XP2 is allowed because its intervention does not alter the syntactic relation between the verb and XP2. This fact indicates that XP2 is situated above the verb, even if XP3 is not realized phonologically (i.e., even if it occurs as null XP). In the remainder of this thesis, I represent null XP when it is necessary for the purpose of discussion.

(24) John broke the vase by hitting it against the wall. (cf. (21a))

The event evoked by an XP2 element can be unambiguously interpreted as a causing event when the syntactic structure that involves it also includes an XP3 element, such as the structures in (13) and (14). In this case, the XP2 element asymmetrically c-commands V and the XP3 element.

In sentence (22a), XP3 and V in (13a) are *in pieces* and *shatter*, respectively. In this case, the PP and V satisfy the non-symmetric relation condition, because they are in a syntactic relation of mutual c-command. This means that the relation between the events evoked by the PP and V is interpreted as the identical relation. The vase becoming in pieces is the same as the vase becoming shattered; the PP and V refer to an identical event. In fact, the sentence in (22a) cannot be paraphrased as the subsequent sentence because there is no causal relation between the events denoted by the PP and V.

(25) ?? John shattered the vase so that it became in pieces.

The subordinate clause introduced by *so that* indicates a result event, and the main clause denotes a causing event. The semantic oddness of the sentence in (25) explicitly suggests that shattering the vase and the vase becoming in pieces are not in a causal relation. The PP and V refer to the same event.

My claim that the event structure is determined by the hierarchical relations of event-denoting expressions in syntax is conceptually compatible with the causal chains proposed by Croft (1991). For example, the happening described by the sentence in (26) can be decomposed into the causal chain in (27).

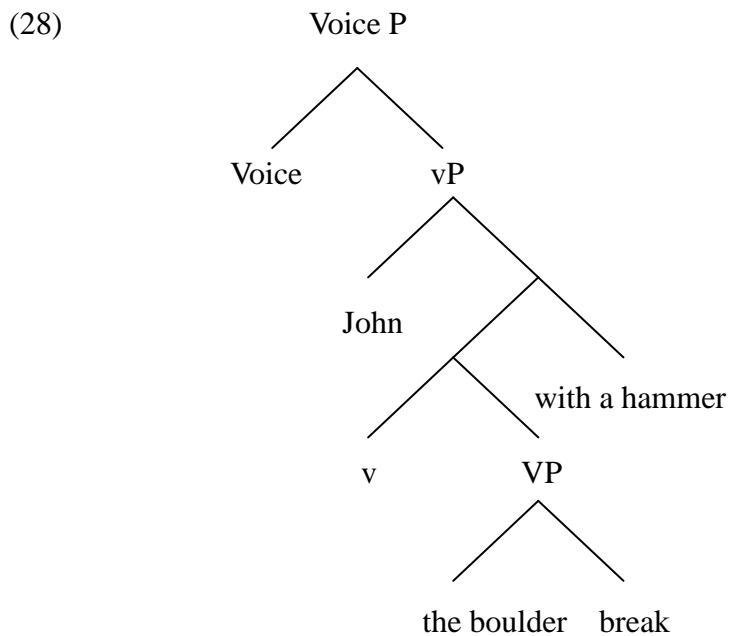
(26) John broke the boulder with a hammer.

(27) John hammer boulder



(Croft (1991:166), with modifications)

The arrows in the causal chain represent the transmissions of force: John acts on the hammer, and the hammer acts on the boulder. This causal chain is reflected in the tree structure in (28):



In accordance with the causal chain in (27), this structure reads that the event in which John did something with a hammer caused the event in which the boulder broke. The correlation between the conceptual structure in terms of the causal chain in (27) and the syntactic structure in (28) suggests that event structure and syntax are the same grammatical object.

Throughout this thesis, I defend the idea that the nature of event structure is a hierarchical relation read off from syntax. Crucially, the internal structure of event structure is determined by syntactic structures, and the syntactic structures allow only two relations

between events, the asymmetric relation and the non-asymmetric relation. Accordingly, possible semantic relations between events are restricted to causality and identity, respectively. I will show the empirical validity of the theory of event structure proposed here through the investigations into various phenomena concerning argument realizations.

5. Organization

The organization of this thesis is as follows. Chapter 2 introduces the event structure theory, and provides its theoretical and empirical motivations. From the viewpoints of the theory proposed in chapter 2, chapters 3-8 give an event-based account of various phenomena associated with argument realizations. Specifically, chapters 3-5 are concerned with the co-occurrence restriction of a change of state expression and a change of location expression in a single clause (i.e., the Unique Path Constraint effect (Goldberg (1991))) and show that the proposed event structure theory gives a straightforward account of the co-occurrence restriction. Chapters 6-7 discuss verbs that denote sound emission and those that designate disappearance, which we call sound emission verbs and disappearance verbs, respectively. These verbs are compatible with path phrases, even though they do not inherently exhibit motion sense. I show that the syntactic behavior and semantic characteristics of these verbs automatically follow from the event structure theory. Chapter 8 addresses the co-occurrence of motion verbs such as *go* and two types of path phrases: those that are associated with causal interpretations and those that further specify the meaning of the verbs. I show that the hierarchical event structure analysis can give a successful account of the different syntactic and interpretational characteristics of the two types of path phrases. Chapter 9 gives concluding remarks.

Chapter 2

The Event Structure Theory

In this chapter, I propose an event structure theory, which I call the hierarchical event structure theory, arguing that event structure is defined by hierarchical syntactic structures. As a preliminary to this enterprise, in section 1 I show three distinct syntactic analyses of the sentences of transitives, passives and unaccusatives. Based on the analyses, section 2 develops the hierarchical event structure theory, and shows its theoretical motivations. Section 3 shows that the hierarchical event structure theory has immediate empirical consequences. Section 4 presents some concluding remarks.

1. Feature Settings on *v* across Voice Types

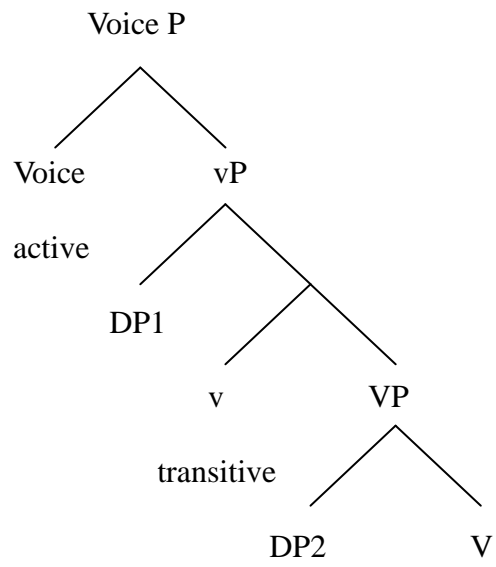
It has been assumed that passive sentences lack the external argument and that they have a vP structure similar to sentences that involve unaccusative verbs (cf. Alexiadou (2010), Alexiadou and Schäfer (2006) and Schäfer (2008), among others, who argue that English unaccusatives appear in a single vP structure without Voice P).¹ In this thesis, following Merchant's (2013) idea that the head responsible for voice alternations is separated from that introducing an external argument, I assume that the three sentence types are associated with distinct syntactic structures. They share the same VP, with distinct featural settings on *v* ([+Agent] (transitive) or [−Agent] (unaccusative)) and Voice (active or passive).² The presence of agentive features on *v* triggers *v*-transitives, whereas their absence results in

¹ Collins (1997) argues for the split VP analysis of unaccusative verbs on the basis of locative inversion constructions.

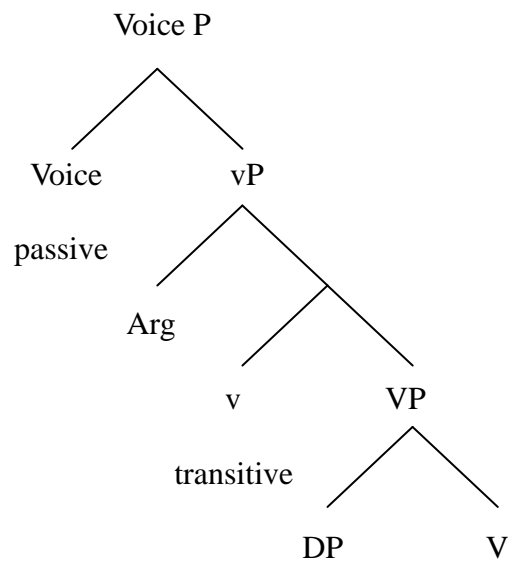
² Schäfer (2008) states that natural cause subjects are licensed when *v* (i.e. Voice in his analysis) lacks agentive features. If his analysis is correct, the feature setting [−Agent] on *v* allows transitive structures as well. However, I would like to leave this issue for future research.

v-unaccusatives.

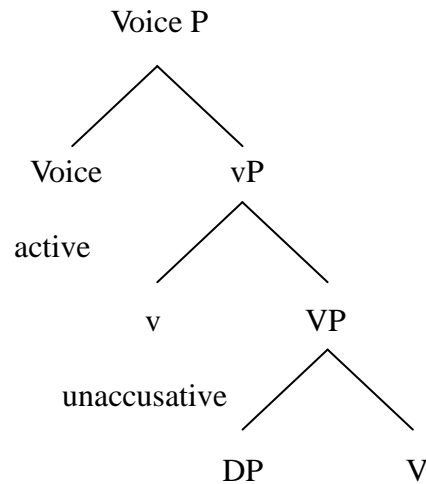
(1) Transitives



(2) Passives



(3) Unaccusatives



I assume that even passive sentences involve an external argument implicitly, which is represented as *Arg* in the specifier position of *vP* in (2) (Merchant (2013)).³ This assumption successfully captures the intuition that active sentences and their corresponding passive sentences share the syntax; the only difference is whether the Voice head is specified as active or passive. Consequently, the three syntactic structures in (1) through (3) can be labeled as follows:

- (4) a. v-transitive [+AGENT] (e.g., (1) and (2))
- b. v-unaccusative [-AGENT] (e.g., (3))

Note that the three syntactic structures are distinct in the specifications of the AGENT feature; the feature is specified as active in v-transitive (e.g., Voice-active and Voice-passive), whereas it is inactive in v-unaccusative.

In the literature, it has often been argued that passive sentences also include v-unaccusative, with no external argument in its specifier position. Given this claim, we could

³ *Arg* is the abbreviation for Argument.

predict that a *v* that occurs in passive sentences and one that appears in active sentences with unaccusative verbs share the syntax, contrary to my analysis, in which the former and the latter are crucially different in the featural specifications of agentivity. The remainder of this section shows that a *v* that occurs in passive sentences and one that is associated with unaccusative verbs in active sentences exhibit six distinct syntactic behaviors. The observations argue for my analysis.

1.1. Agentive *By* Phrases

The first distinct syntactic behavior is concerned with the compatibility with an agentive *by* phrase. The AGENT feature is associated with agentivity, so *v*-transitive in passive sentences, which includes the AGENT feature, is compatible with an agentive *by* phrase. On the other hand, *v*-unaccusative, which lacks the feature, cannot appear with it. Consider the following:

[*v*-transitive]

(5) The window was broken by John.

(Schäfer (2008:139))

[*v*-unaccusative]

(6) * The window broke by John.

(Schäfer (2008:139))

The contrast shows that *v*-transitive in passive sentences allows an agentive *by* phrase, whereas *v*-unaccusative does not.

1.2. Causer PPs

Second, the AGENT feature is associated with agentivity, so the *v*-transitive, which includes

the AGENT feature, is incompatible with causer PPs that require the absence of agentivity. v-unaccusative, on the other hand, allows the co-occurrence of such causer PPs because it does not have an agentive feature.

[v-transitive]

- (7) * Eva was killed *from cancer*. (Kalluli (2007:771), italics are mine)
(cf. Breast cancer kills more women than any other form of cancer. (BNC))

[v-unaccusative]

- (8) The window broke {from the pressure / from the explosion / from Will's banging}. (Alexiadou and Schäfer (2006:41))

The causer PPs headed by *from*, which requires the absence of agentivity, are not compatible with v-transitive, whereas they are compatible with v-unaccusative.

1.3. Control

Third, v-transitive in passive sentences allows an implicit agent to function as a syntactic controller, whereas v-unaccusative does not, because the latter has no external argument.

[v-transitive]

- (9) The boat was sunk to collect the insurance. (Roeper (1987:268))

[v-unaccusative]

- (10) * The boat sunk to collect the insurance. (Roeper (1987:268))

1.4. Instrumental Phrase

The fourth distinct syntactic behavior concerns compatibility with an instrumental PP, which is licensed by an agent. v-transitive allows the occurrence of an instrumental PP, while v-unaccusative does not.

[v-transitive]

- (11) The vase was broken *with a hammer*.

[v-unaccusative]

- (12) * The vase broke *with a hammer*.

1.5. Intentionality

The fifth is concerned with the notion of intentionality. Usually, an animate agent can be associated with intentionality. v-transitive allows modifications with expressions that denote the intentionality of an agent, whereas v-unaccusative does not.

[v-transitive]

- (13) Once set, the chocolate can be cut carefully into the required shape with a sharp non-serrated knife. (BNC)

[v-unaccusative]

- (14) * The door opened {carefully / unintentionally / reluctantly}.

(Kageyama (1996:150))

1.6. *By Itself*

Lastly, v-transitive in passive sentences is not compatible with the PP *by itself*, which denies the existence of any external cause because v-transitive entails the existence of an agent as an

external cause. v-unaccusative, on the other hand, does not forbid such a PP.

[v-transitive]

(15) * The vase was broken by itself. (Schäfer (2008:144))

[v-unaccusative]

(16) The vase broke by itself. (Schäfer (2008:144))

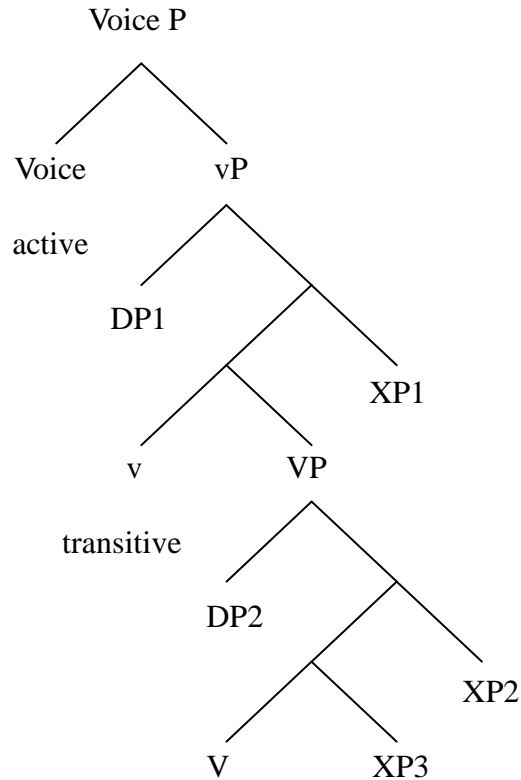
1.7. Interim Conclusion

In this thesis, following Alexiadou and Schäfer (2006), I assume that active, passive and unaccusative sentences have distinct syntactic structures. Although v-transitive in passive sentences and v-unaccusative have been supposed to share the VP structure in the literature, the featural settings in v are crucially different; v-transitive in passive sentences includes an agentive feature, whereas v-unaccusative does not. This significant difference emerges as distinct syntactic behaviors, as we have observed in this section.

2. Event Structure Layers

In this thesis, I propose that event structure is defined hierarchically on syntactic structures. A causal relation holds between a hierarchically higher event and a lower event, in which the former causes the latter. Hierarchically invariant event-denoting elements share an identical denotation. The following tree structure exemplifies the structure of v-transitive with Voice-active.

(17)



(18) [[[[V XP3] XP2] XP1]...]

- a. asymmetric relation: causality
- b. non-asymmetric relation: identity

(19) a. v-transitive [+AGENT]

- b. v-unaccusative [-AGENT]

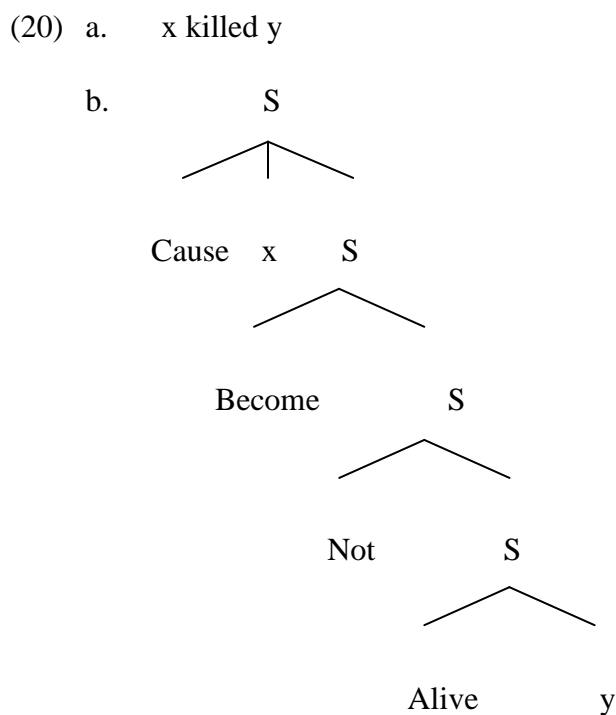
Each XP and V in (18), which picks up the only relevant portion of the tree structure in (17), denotes an event. The two possible relationships between events in (18) do not vary regardless of the differences of the featural specification of v and voice types. Crucially, hierarchical relationships between XPs on syntactic structures determine causal relations between events denoted by them.

The aim of this subsection is to provide theoretical motivation for the hierarchical event structure theory. In section 2.1, I show the theoretical motivation for the two possible relations between events in (18). In section 2.2, I reveal the syntactic mechanisms that underlie the two

possible relations.

2.1. Theoretical Motivations

The proposal that causal relations are associated with syntactic structures is by no means a new idea. Since the introduction of generative semantics, it has been claimed that causal relations are read off from syntactic structures.

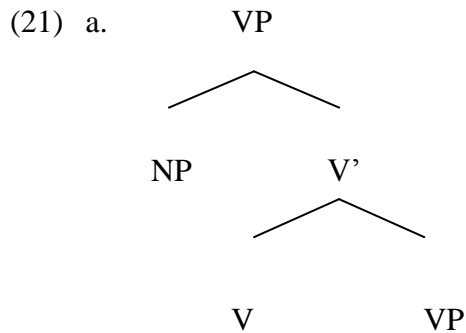


(McCawley (1968:73))

McCawley, for example, argues that causative sentences such as (20a) are derived from an abstract syntactic structure that is composed of primitive predicates, as in (20b). This structure reads ‘x causes y to become not alive,’ which expresses a causal relation between the participant *x* and the event *y becomes not alive*. In this structure, the causal relation is encoded in the syntactic structure explicitly in the form of predicate decompositions.

The claim that causal relations are encoded in syntactic structures is later adopted by

several researchers, including Hale and Keyser (1993, 2002), who argue that a causal relation is read off syntactic structures such as (21a), in which the upper VP is interpreted as cause and the lower VP as result.



b. Corresponding to this syntactic relation, there is a similarly asymmetric (semantic) relation between two events, a relation we will take to be that of *implication*.

c. $e_1 \rightarrow e_2$

(Hale and Keyser (1993:67-69))

Although the methods of encoding causal relations in syntactic structures varies with researchers (Ramchand (2008), Borer (2005), Ritter and Rosen (1998), Hale and Keyser (1993, 2002), Alexiadou (2006), Alexiadou and Schäfer (2006), Schäfer (2008)), it is fair to say that these researchers presuppose that causal relations hold between hierarchically higher elements and lower ones.

This presupposition, however, seems to be by no means self-evident. It is unclear why the relation between two events encoded by hierarchically distinct syntactic elements has to be a causal relation, but not any other. Logically speaking, it would be possible that all the following relations exist between two events.

- (22) Relationships between the two events e_1 and e_2 :
- a. e_1 causes e_2
 - b. e_1 equals e_2
 - c. e_1 follows e_2
 - d. e_1 precedes e_2
 - e. e_1 and e_2 occur simultaneously
 - f. e_1 and e_2 occur at the same place

Suppose that e_1 and e_2 denote events. (22a) exemplifies a causal relation between two events. In (22b), the events of e_1 and e_2 are identical. (22c) shows a relation in which e_1 occurs after e_2 , and (22d) has the opposite relation between them. In (22e) and (22f), two events occur at the same time and at the same place, respectively.

In this way, we can imagine as many relationships between events as possible, though only (22a) is tenable when the event denoting elements are hierarchically arranged. (22b) is also possible when the events are situated at the same height. Possible relations between events are thus strictly limited to only these two.

This limitation follows from a general principle on event structure: a single clause may entail only one macro eventuality. A macro eventuality may include micro eventualities, which compose the macro eventuality, as exemplified by (23):

- (23) $\underbrace{\text{[a micro eventuality] [a micro eventuality] [a micro eventuality]}}_{\text{a macro eventuality}}$

The insight that a single clause may involve only one eventuality has manifested itself in various forms (Unique Path Constraint (Goldberg (1991)), Single Delimiting Constraint

(Tenny (1994)), Further Specification Constraint (Tortora (1998)), and Single Development Constraint (Matsumoto (2006)), among others). All the analyses mentioned share the insight that a single clause may involve only one consistent eventuality; hereafter, let us call this the One Eventuality per Clause Condition.

(24) The One Eventuality per Clause Condition:

A single clause may include only one macro eventuality, which may be composed of micro eventualities.

This event structural principle is syntactically relevant in that it associates the syntactic unit *clause* with an eventuality. The limitation on possible relations between events follows from this event structural condition. A macro eventuality equals an eventuality that includes micro eventualities that are interrelated with each other; otherwise, a macro eventuality could not be one consistent eventuality. This condition guarantees micro eventualities involved in a macro eventuality combine together closely. The interrelationships between micro eventualities can be accomplished when the occurrence of one micro eventuality depends on the occurrence of another. Note that causal relations meet the interrelationship requirement because causally related micro eventualities involve a dependence relation; when event e_1 causes event e_2 , for example, the occurrence of e_2 is crucially dependent on the occurrence of e_1 , although the occurrence of e_1 may not be affected by the occurrence of e_2 . The relation in (22b), in which the two micro eventualities are identical, also meets the interrelationship requirement. In this case, there is no need to posit two independent micro eventualities, because the two micro eventualities are identical; virtually, there is only one micro eventuality.

Other relationships between micro eventualities exemplified in (22c-f), which are based on spatio-temporal relations, are excluded from the possible relations because they cannot

meet the interrelationship requirement.⁴ The temporal relationship between the two micro eventualities e_1 and e_2 in (22c) do not entail that the occurrence of one micro eventuality is dependent on that of the other. It may often be the case that the occurrence of e_1 is affected by the occurrence of e_2 when the latter occurs before the former. In this case, however, the relationship between the two micro eventualities is crucially guaranteed by a causal relation, but not by a temporal relation. The same is true of (22d), in which case the order of the occurrences of the two micro eventualities is reversed. Even if the two micro eventualities happen at the same time, as in (22e), there is no dependence relation between them. The simultaneity of the occurrence of two micro eventualities cannot combine the two because the occurrence of one does not depend on that of the other, in the same way as the cases in (22c, d). Simultaneity does not entail a dependence relation. As a result, the two micro eventualities in (22e) remain distinct and cannot combine to form a consistent macro eventuality. The spatial relationship exemplified in (22f) also fails to meet the interrelationship requirement. The fact that two micro eventualities happen at the same place does not entail that the occurrence of one is dependent on the other. Without the notion of causality or identity, more than one micro eventuality cannot be unified into a single consistent macro eventuality.

Consequently, causality and identity are the only two possible event structural

⁴ Croft (1991), following Davidson (1969), argues for the definition of an event in terms of a causal relation. He states that a spatio-temporal definition of an event is inadequate. Note that not all the events can be located at a certain place.

- (i) * Mrs. Woodland was widowed in Las Vegas.

Croft (1991:159) states that ‘The action of being widowed cannot be located at either the location of the person dying or that of the person being widowed.’ This example suggests that an event cannot be defined by the notion of space. The same is true of the temporal definition of an event.

- (ii) Brutus killed Caesar by stabbing him.

‘When the victim’s death occurs far away from the location of the stabbing (and also long after the time of the stabbing), one does not want to say that the killing occurred at either location (or time, for that matter) alone or in a combination of both (Croft (1991:159-160), with slight modifications).’ These examples illustrate that an event cannot be defined on the basis of the spatio-temporal notion.

relationships between micro eventualities.^{5,6} The two event relationships can be characterized in terms of the presence or absence of an asymmetric relation between two micro eventualities. An asymmetric relation holds between two micro eventualities when the occurrence of one depends on that of the other. A non-asymmetric relation exists between two micro eventualities if they share an identical eventuality. Note that the two event structural relationships are assumed to be based on the One Eventuality per Clause Condition, which is crucially a syntactic principle. For this reason, the two event structural relationships have to be associated with syntactic structures. In fact, assuming binary branching syntactic structures (Kayne (1984)), there exist only two possible structural relations in syntax between two syntactic elements: the asymmetric relation and the non-asymmetric relation (i.e., a sister relation). In this way, the two event structural relations, causality and identity, are systematically motivated by the two syntactic relations, asymmetry and non-asymmetry, respectively.

In summary, this section has argued for theoretical motivations for assuming the two event structural relations, showing that they are systematically associated with the architecture of syntax. The enterprise I develop in this thesis is in accordance with the assumption that

⁵ As for texts that comprise more than one sentence, it seems that the possible options of the construal of such sentences are not restricted to these two. For example, observe the following example:

- (i) John was injured. He fell down.

In this example, the second sentence explains the reason for the event described in the first sentence. Here, the relation between the two sentences is an explanation relation, though it might also be possible that the two sentences are connected by a causal relation. I would like to leave a systematic analysis of such an example for future research.

⁶ It is well known that the frame *in -ing* in the following sentence serves to re-describe the event in the main clause.

- (i) In reciting a limerick Jones was breaking his promise. (Kearns (2003:603))

This sentence is true when Jones promised not to recite a limerick. Note that reciting a limerick equals breaking his promise. If my analysis were applied to such an example, the two events *reciting a limerick* and *breaking his promise* would be connected by an identity relation. However, a closer scrutiny of such an example requires that we clarify whether *reciting a limerick* can be analyzed in the same way as the XPs in my analysis. I would like to leave this matter for future research.

event structure is read off from syntax and that event structure does not exist prior to syntactic computations.

For the hierarchical event structure theory to work, however, I have to invent an appropriate syntactic mechanism that can capture the two event structural relations. This task requires that we find the syntactic mechanisms that underlie the relations between events.

2.2. The Syntax of Event-Denoting Elements

In this thesis, I assume that a single event is a proposition that is represented by the combination of a subject and a predicate that is predicated of the subject.⁷

A predicate is an expression that is incomplete as a proposition, and therefore, it requires an argument to be completed. I adopt the definition of a predicate and its licensing condition proposed by Rothstein (2001):⁸

⁷ Williams (1980:206) states that any category, including AP, NP, PP, and VP can be a predicate.

- (i) AP: John made Bill *sick*.
- NP: John made Bill *a doctor*.
- PP: John kept it *near him*.
- VP: John *died*.

In these examples, each predicate in italics is predicated of the DP it immediately follows. Rothstein (2001:129) observes that adverbs cannot be predicated of arguments:

- (i) a. The destruction of the city was { brutal / *brutally }.
- b. The reading of the verdict was { slow / *slowly }.
- c. John considered [the running { slow / *slowly }].

In these sentences, the adjectives can be used as predicates, whereas the adverbs cannot.

⁸ Syntactic predicates are contrasted with grammatical predicates; although the former are always monadic, the latter can be monadic or polyadic (Rothstein (1983)). The typical counterparts of the grammatical predicates are lexical heads such as *see* in the following sentence:

- (i) John saw Mary.

In this sentence, the verb *see*, which is a grammatical predicate, takes two arguments, *John* and *Mary*; therefore, the grammatical predicate *see* is a two-place predicate in this case. The number of arguments the grammatical predicates take is determined by the lexical meaning of the predicates. On the other hand, what Rothstein calls a syntactic predicate corresponds to the VP *saw Mary*. This VP is an incomplete function requiring an argument; here, the syntactic predicate *saw Mary* is a one-place predicate. The number of arguments the syntactic predicate takes does not vary with the types of syntactic predicates; they always take only one argument.

In this thesis, we will simply refer to predicates as syntactic predicates, not grammatical ones, for simplicity.

(25) *Predicate*

A syntactic predicate is a monadic, unsaturated, syntactic function.

(Rothstein (2001:47))

(26) *Predicate Licensing Condition*

Every syntactic predicate must be syntactically saturated. (Rothstein (2001:47))

Following Rothstein, I assume that a predicate is a syntactic function with an open slot, and it must be saturated by an argument. In other words, a predication obtains when an unsaturated predicate is saturated by an argument.

Since Williams (1980), the predication has been considered governed by a syntactic relation defined by c-command, though its definition and detailed theoretical assumptions vary with researchers (cf. Roberts (1988), Hasegawa (1992, 1996), Rothstein (2001), Ikeuchi (2003), among others). In this thesis, I assume that a predicate is saturated by an argument when the latter c-commands the former. More precisely, I assume the following condition:⁹

(27) *Predicate Saturation Condition*

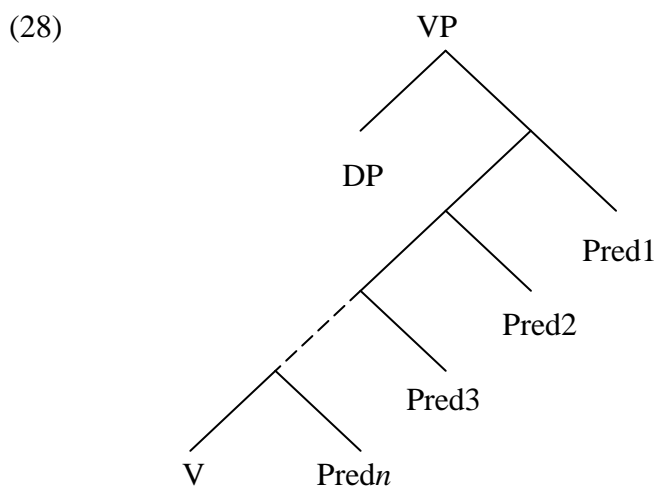
Predicate P is saturated by argument A iff A immediately c-commands P and no argument that c-commands P is c-commanded by A.

The Predicate Saturation Condition requires a local c-command relation between an argument and a predicate. The clause of the Predicate Saturation Condition includes the word *immediately*, from which the strict locality of predication automatically follows (see section 3.6).

⁹ I assume the c-command in terms of the so-called first branching node (Reinhart (1983:18)):

- (i) Node A c (constituency)-commands node B iff the branching node most immediately dominating A also dominates B.

It is known that more than one predicate can be predicated of an argument (e.g., the co-occurrence of multiple secondary predicates in Carrier and Randall (1992) and *θ-identification* in Higginbotham (1985), among others).^{10,11} This fact, in combination with the Predicate Saturation Condition, suggests that more than one predicate can be predicated of an argument, while more than one argument cannot saturate a single predicate. This one-to-many relation between an argument and predicates can be illustrated by (28):



Pred and *V* in this representation indicate a predicate. This representation shows that more than one predicate can be merged to form a complex structure until an argument is merged

¹⁰ Carrier and Randall (1992:221) state that two depictives can be predicated of one argument:

- (i) a. John sketched the model_{i,j} [nude]_i [drunk as a skunk]_j.
 b. John_{i,j} sketched the model [nude]_i [drunk as a skunk]_j.

In sentence (ia), the two depictive predicates are predicated of the object *the model*, whereas in (ib) they are predicated of the subject *John*.

¹¹ Higginbotham (1985), assuming that both adjectives and nouns serve as predicates of arguments, proposes the operation *θ-identification*. For example, observe the following:

- (i) a. That is a big butterfly.
 b. [N' [A big][N butterfly]]

Higginbotham argues that the adjective *big* and the noun *butterfly* serve to work as predicates, and therefore they can assign theta roles to arguments. In this case, it is argued that the two predicates are merged and the theta role of the adjective is identified with that of the noun. Consequently, the two predicates are both predicated of the same argument *that*, to which they assign the identified theta role. Note that the analysis based on the c-command I propose here is not compatible with his analysis because he states that *θ-identification* is constrained to take place under government, which is untenable in Minimalist.

with it. Note that *Pred1* through *Predn* and *V* are not saturated before they are merged with the argument *DP*. In this way, unsaturated predicates can be augmented until they are saturated by an argument.

Furthermore, there is an important structural relation between the predicates (i.e., *Pred* and *V*) in (28). Recall that syntax allows only two types of relations between events: asymmetric relation and non-asymmetric relation. They are defined by the structural relation of c-command:

(29) Asymmetric Relation Condition (ARC):

For event-denoting elements A and B, the event of A causes the event of B iff A c-commands B. ($A > B$)

(30) Non-asymmetric Relation Condition (NRC):

For event-denoting elements A and B, the event of A and the event of B are identical iff A is in a local syntactic relation of mutual c-command with B. ($A = B$)

(31) The event of V can either be caused by the event of another event-denoting element or be in an identical relation with it but cannot cause it. ($V \leq A$)

Keeping these two types of event structural relations in mind, let us consider the relationships between predicates in (28). *Pred1* c-commands all the predicates, *Pred2* c-commands all except *Pred1*, *Pred3* all except *Pred1* and *Pred2*, and so on. As for the relation between *Predn* and *V*, they are in a local syntactic relation of mutual c-command in addition to the relation in which the former c-commands the latter (and vice versa, although the condition in (31) guarantees that *V* cannot denote an event that causes an event referred to by *Predn*). Consequently, the event structural relations between the event-denoting elements (i.e., *Pred*

and V) are as follows:

$$(32) \quad E_V \leq E_{Predn} \dots < E_{Pred3} < E_{Pred2} < E_{Pred1}$$

In this representation, the subscripts indicate the predicates that correspond to those in (28), and E denotes an event that is constituted by an argument and a predicate.

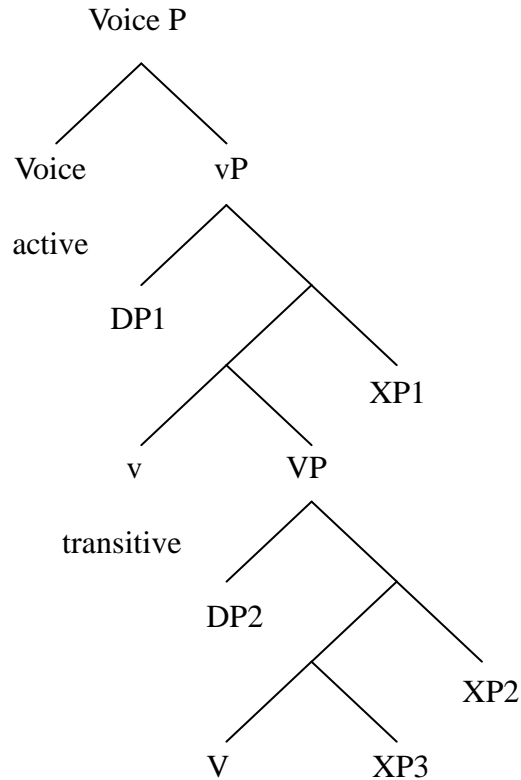
To summarize this subsection, I have shown that an event is a grammatical unit that is composed of an unsaturated predicate and an argument that saturates it. The saturation of predicates is governed by the local syntactic relation of c-command. More than one predicate can be augmented until an argument that saturates the predicates is merged, but more than one argument cannot saturate one predicate. Importantly, the augmented predicates are hierarchically ordered, forming asymmetric and non-asymmetric relations. The two types of relations are defined by c-command, and they reflect the causality and identity of events, respectively.

Thus far I have developed the hierarchical event structure theory. The next section provides its empirical consequences.

3. Empirical Consequences of the Hierarchical Event Structure Theory

The architecture of the hierarchical event structure theory in (17-19) is repeated here for convenience.

(33)



(34) [[[[V XP3] XP2] XP1]...]

- a. c-command relation: causality
- b. mutual c-command relation: identity

- (35) a. v-transitive [+AGENT]
b. v-unaccusative [-AGENT]

In section 3.1, we observe what type of event-denoting elements can be associated with each XP position. The remainder of section 3 provides empirical consequences of the proposed theory.

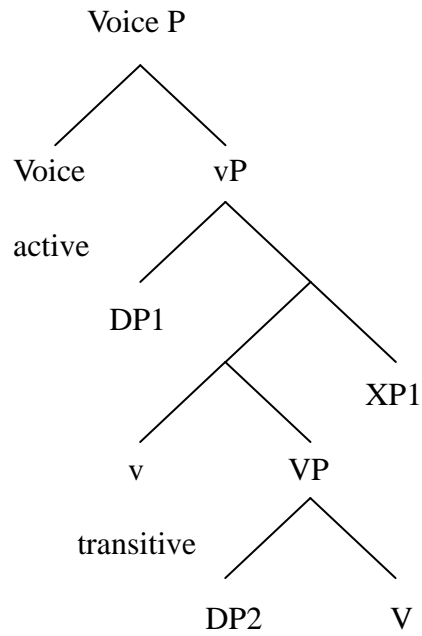
3.1. XPs

First, we look into what types of expressions are associated with each XP position.

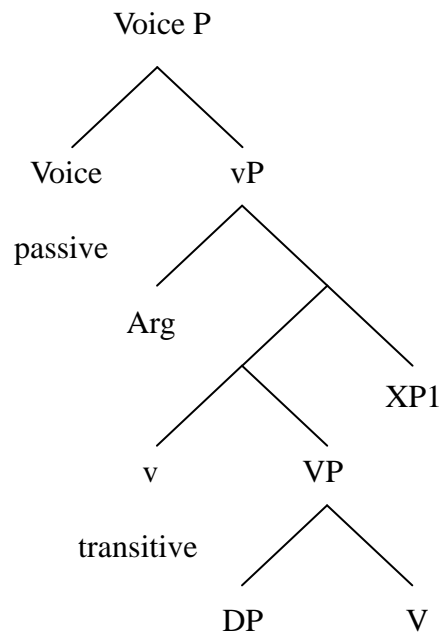
3.1.1. XP1

Let us first consider XP1, which is adjoined to vP.

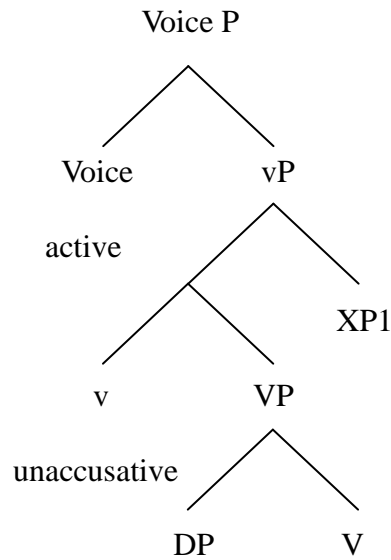
(36) Transitives



(37) Passives



(38) Unaccusatives



Instrumental PPs presuppose the existence of an agent that serves as the controller of the instrument, so the occurrences of instrumental PPs are sensitive to the agentivity feature of *v*. *v*-transitive, regardless of whether the Voice head is specified as active or passive, is marked [+AGENT], and therefore, it is predicted that they allow instrumental PPs (Alexiadou (2010), Guéron (2005), Alexiadou and Schäfer (2006) and Schäfer (2008), etc.), but not in the case of *v*-unaccusative, which is [−AGENT]. In fact, instrumental PPs are compatible with *v*-transitive with active Voice or passive Voice but not with *v*-unaccusative.

[*v*-transitive with active Voice]

(39) John broke the vase *with a hammer*.

[*v*-transitive with passive Voice]

(40) The vase was broken *with a hammer*.

[*v*-unaccusative]

(41) * The vase broke *with a hammer*.

In the case of v-unaccusative, on the other hand, XP1's position is associated with causer PPs that do not presuppose the existence of an agent, as exemplified in (42):

- (42) a. The vase broke *from the earthquake*.
b. The vase broke *because of the earthquake*.

The causer PP *from the earthquake* in (42a) denotes a causing event. In fact, the PP can be paraphrased with the *because of* phrase, as in (42b).

Causer PPs such as *from the earthquake* indicate that the cause of an eventuality is other than an agent, and therefore, such causer PPs may appear only with v-unaccusative, not with v-transitive.

[v-transitive with active Voice]

- (43) * The sun broke the window *from its heat*.¹²

[v-transitive with passive Voice]

- (44) * Eva was killed *from cancer*. (= (7))

[v-unaccusative]

- (45) The window broke *from the heat of the sun*.

3.1.2. XP2

Next, I assume that the position of XP2, which is in a causal relation with the eventuality

¹² This sentence becomes acceptable if the preposition *from* is replaced with *with*:

- (i) The sun broke the window with its heat.

The ill-formedness of the v-transitive structure with a *from* phrase remains even if the subject NP is an animate agent:

- (ii) ?? John broke the vase accidentally { *from / because of* } the earthquake.
(meaning: the earthquake caused John to break the vase accidentally.)

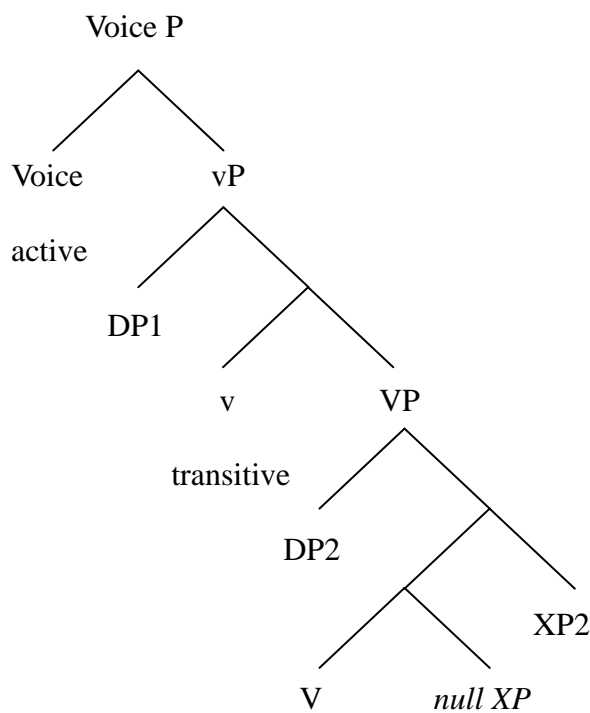
evoked by V (in contrast to XP3), can be associated with PPs that evoke motion followed by physical contact, such as *against the wall*. This PP denotes means or causes of an eventuality, as indicated by the paraphrase:

- (46) a. John broke the vase against the wall.
 b. John hit the vase against the wall so that it broke.

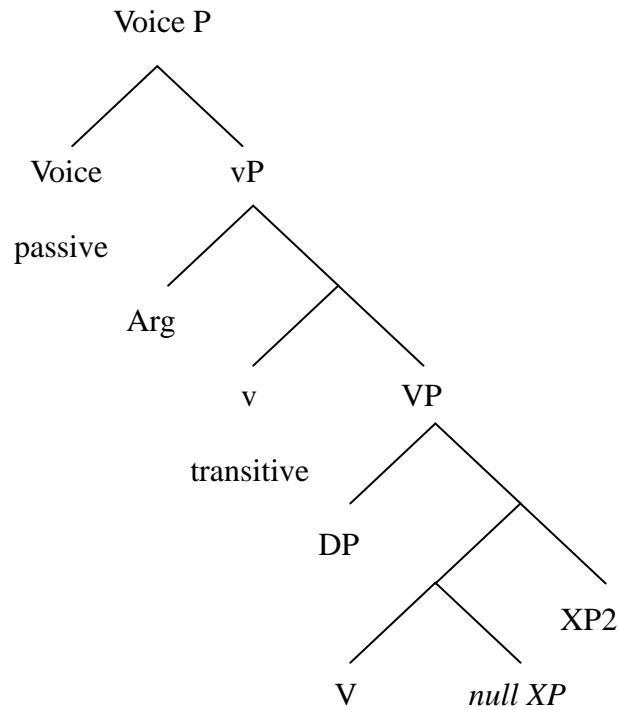
Sentence (46a) can be paraphrased with (46b), which explicitly suggests that the motion evoked by the PP caused an eventuality denoted by *break*.

Crucially, the position of XP2 is shared by the two types of v (i.e., transitive v and unaccusative v).

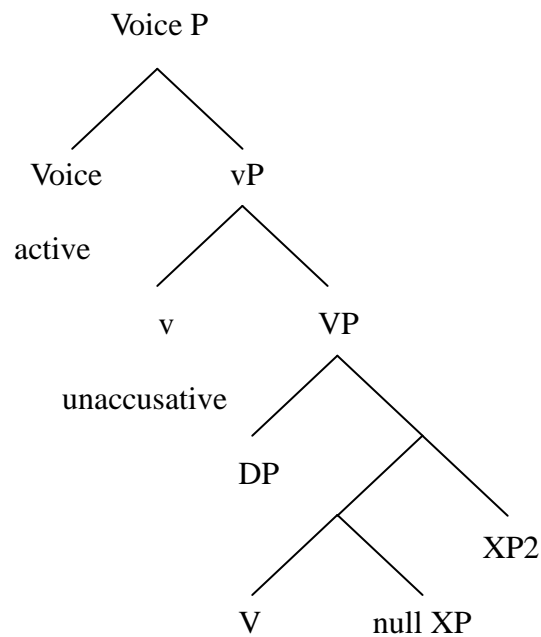
(47) Transitives



(48) Passives



(49) Unaccusatives



Thus, it can be predicted that the two types of v, regardless of active or passive Voice, allow the occurrence of such an expression. This prediction is borne out by the following data:

[v-transitive with active Voice]

- (50) a. John broke the vase on(to) the floor.
b. John broke the vase against the wall.

[v-transitive with passive Voice]

- (51) a. Glass was shattered onto the coffee table and carpet. (A. Barton, *High Rise*)
b. A lantern also rose up and was broken against the wall.

(C. Richet, *Thirty Years of Psychical Research*)

[v-unaccusative]

- (52) a. The vase broke on(to) the floor.
b. The vase broke against the wall.

The *against* and *on(to)* phrases evoke the event of motion followed by contact, which causes another eventuality.

3.1.3. XP3

Finally, let us assume that the XP3 position is associated with expressions that denote result, such as *in pieces* below, which can be caused by other eventualities connected with higher XP positions.¹³

- (53) a. John shattered the vase in pieces.
b. ?? John shattered the vase so that it became in pieces.

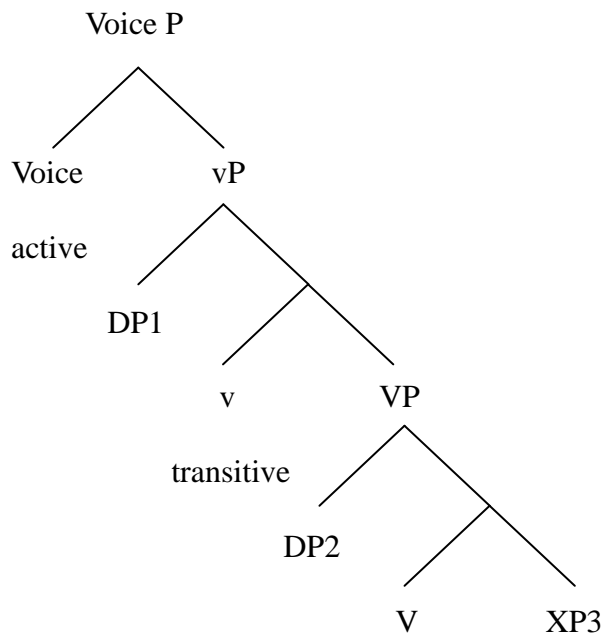
The verb *shatter* and the result phrase *in pieces* are in the non-asymmetric relation, and

¹³ In this thesis, we use the term “result phrase” as well when we refer to elements that are associated with the XP3 position. Note that we also refer to the events denoted by XP3 as result events for convenience.

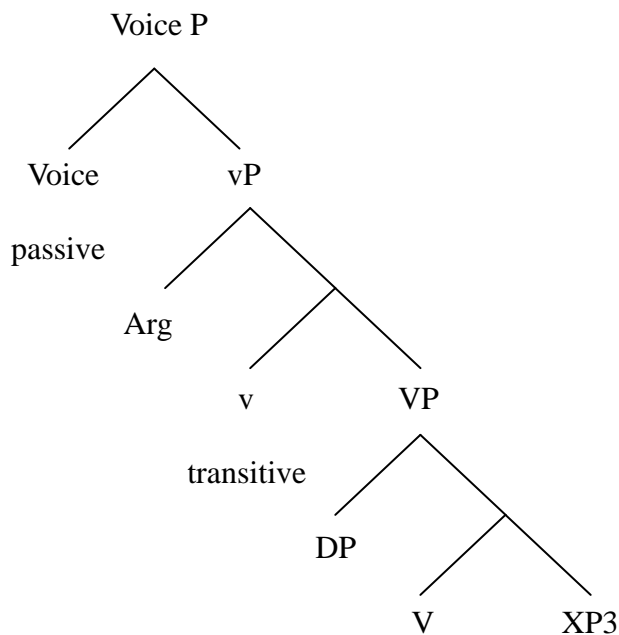
therefore, the two eventualities expressed by them are identical. In fact, we cannot divide the two eventualities with *so that*. The sentence in (53b), which divides the two eventualities in terms of causal relation, results in the unacceptability.

Again, the XP3 position is shared by the two types of v, regardless of Voice types.

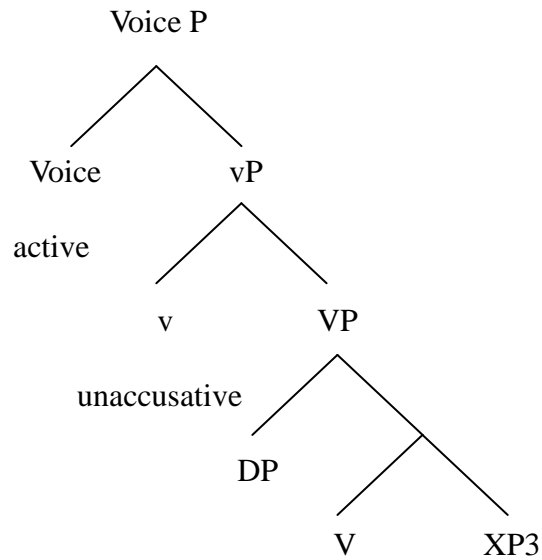
(54) Transitives



(55) Passives



(56) Unaccusatives



We can predict that result phrases, which are associated with the XP3 position, are compatible with the two types of v, regardless of whether Voice is active or passive, and so they are.

[v-transitive with active Voice]

(57) John broke the vase into pieces.

[v-transitive with passive Voice]

(58) The vase was broken into pieces.

[v-unaccusative]

(59) The vase broke into pieces.

The availability of a result phrase across the v types and Voice types explicitly suggests that it is associated with the XP3 position.

Note that the syntactic positions of XP3 and a change of state verb such as *break* are in a non-asymmetric relation, and therefore they evoke an identical eventuality. For this reason, the verb *break* is compatible with the XP3 *into pieces*, which shares the (partly) identical

meaning with it (more precisely, the latter further specifies the former), whereas it is not compatible with a result phrase such as *worthless*, which evokes a completely different event than the event denoted by *break*.

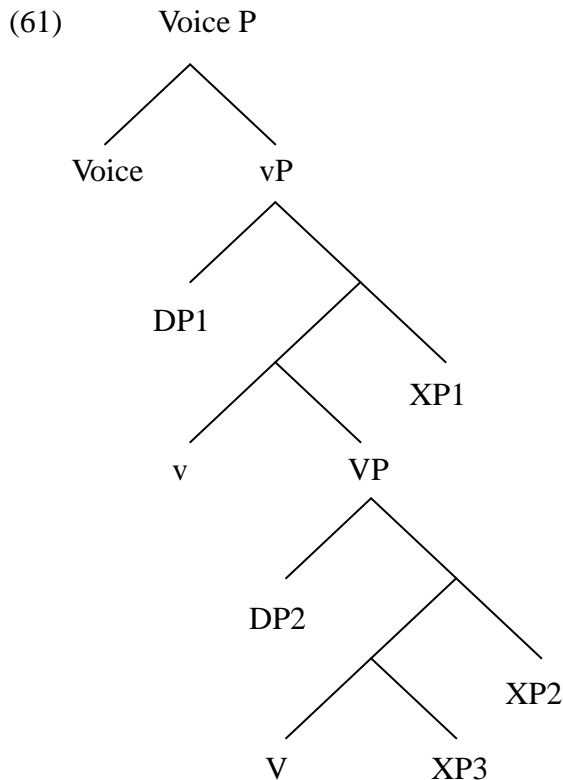
- (60) a. * Bill broke the vase worthless.
b. * The vase broke worthless.

(Jackendoff (1990:240))

In summary, this subsection has shown that each XP position is associated with a certain type of event-denoting expression.

3.2. The Order of XPs

Each event-denoting expression occurs in distinct syntactic positions, as indicated by each XP position in the following tree structure:



From this hierarchical event structure analysis, we can predict that the linear order of XPs is determined in accordance with their hierarchy in the syntactic structure. This subsection confirms this prediction.

3.2.1. XP1 and XP2

First, let us consider the co-occurrence of XP1 and XP2. Note that the type of XP1 varies with the feature settings of $[\pm\text{AGENT}]$ in v . When v is marked $[\text{+AGENT}]$, XP1 is associated with an instrumental PP; when v is $[\text{-AGENT}]$, the XP1 position is occupied by a causer PP. Although the type of XP1 may vary with v properties, XP1 has to be higher than XP2 hierarchically. This hierarchical ordering can be confirmed by the following data:

[v-transitive with active Voice]

- (62) a. John broke the vase against the wall with his right hand.

b. ?? John broke the vase with his right hand against the wall.

[v-unaccusative]

(63) a. The vase broke on(to) the floor from the earthquake.

b. * The vase broke from the earthquake on(to) the floor.

For linear orderings, hierarchically higher XPs occur to the right of the hierarchically lower ones. In (62a), the XP1 *with his right hand*, which is higher, follows the XP2 *against the wall*, and this sentence is acceptable. In (62b), on the other hand, the ordering of XP1 and XP2 is reversed, and this sentence results in unacceptability. Likewise, (63a) is felicitous because the XP1 *from the earthquake* follows the XP2 *on(to) the floor*. When the XP1 precedes the XP2, this sentence becomes unacceptable, as in (63b).

3.2.2. XP2 and XP3

Next, let us turn to the linear ordering of XP2 and XP3. Because XP2 is hierarchically higher than XP3, it is predicted that XP2 must follow XP3. This prediction can be confirmed by the following contrast.

[v-transitive with active Voice]

(64) a. John broke the vase into pieces against the floor.

b. ?? John broke the vase against the floor into pieces.

In this case, XP2 is *against the floor*, and XP3 *into pieces*. As the contrast in acceptability shows, XP2 must follow XP3, confirming the proposed hierarchy.

3.2.3. XP1 and XP3

Finally, let us consider the linear order restriction of XP1 and XP3. Again, we can predict that XP1 must follow XP3 because the former is hierarchically higher than the latter. This prediction is borne out by the following data:

[v-transitive with active Voice]

- (65) a. John broke the vase into pieces with a hammer.
b. ?? John broke the vase with a hammer into pieces.

The data show that the XP1 *with a hammer* can follow the XP3 *into pieces*, and not vice versa.¹⁴

3.3. Constituency Tests

Standard constituency tests, the *do so* substitution test and the pseudo-cleft test, also provide evidence for the hierarchical event structure theory. First, XP1 is adjoined to vP, above the position to which V raises, as shown in (66), so it is predicted that XP1 can be left behind by a pro-form of VP in *do so* substitution and a pseudo-cleft sentence.¹⁵

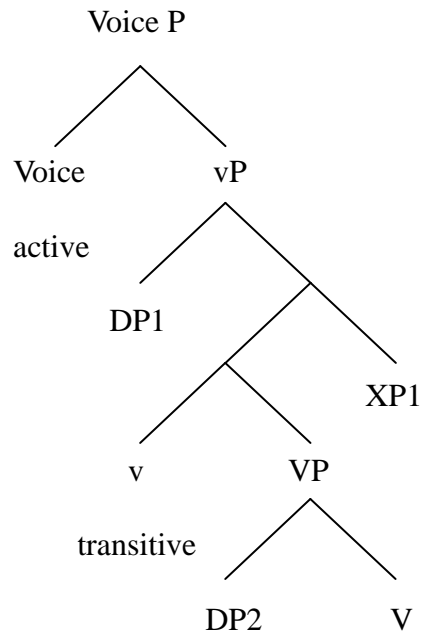
¹⁴ The analysis in which instrument PPs are adjoined to vP can be further evidenced by the following data.

- (i) a. John broke the vase with a hammer so that she would be surprised.
b. * John broke the vase so that she would be surprised with a hammer.

Guéron (2005) states that a purpose adverbial is adjoined to TP. The contrast in acceptability in (i) suggests that the instrument PPs are situated below TP, in accordance with my analysis.

¹⁵ Janke and Neeleman (2012) observe that *do so* substitution applies to a constituent dominated by V', leaving behind adjuncts that are associated with V'.

(66) Transitives



(=36)

In fact, XP1 can be left behind by a pro-form of VP in these two syntactic operations:

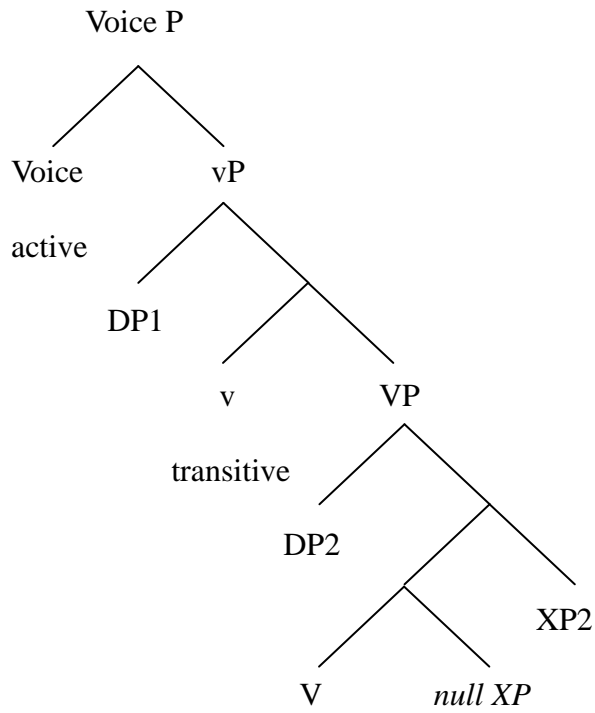
[XP1]

- (67) a. John said he would break the vase with a hammer, but instead he did so with a bat.
- b. What he did with a hammer was break the vase into pieces.

The instrument PP *with a hammer*, which is situated at the XP1 position, can remain outside the scope of the pro-forms *did so* and *did*.

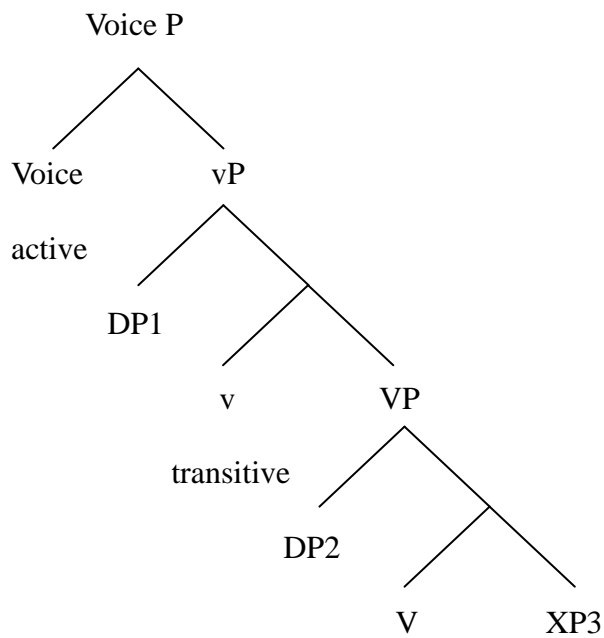
By contrast, as shown in (68) and (69), XP2 and XP3 are situated below *v*, to which *V* raises, so they cannot be outside of the scope of the pro-forms of VP in the *do so* substitution and pseudo-cleft sentences.

(68) Transitives



(=(47))

(69) Transitives



(=(54))

[XP2]

(70) a. ?? John broke the vase against the floor, and Mary did so against the wall.

b. * What John did against the floor was break the vase.

[XP3]

(71) a. * John said he would break the vase into pieces, but instead he did so into a thousand pieces.

b. * What he did into pieces was break the vase with a hammer.

XP2 and XP3 correspond to *against the floor* and *into (a thousand) pieces*, respectively.

These constituency tests explicitly show the validity of the hierarchy of XPs in the hierarchical event structure theory.

3.4. The Co-occurrence of XPs

The possibility of the co-occurrence of XPs also provides further evidence for the hierarchical event structure theory. Because the three types of XPs appear in distinct syntactic positions, it is predicted that they can co-occur in a single clause. This prediction is borne out by the following data:

(72) John broke the vase into pieces onto the floor with his right hand.

(73) The vase broke into pieces onto the floor from the earthquake.

Sentence (72), which has v-transitive, includes the XP1 *with his right hand*, the XP2 *onto the floor*, and the XP3 *into pieces*. Likewise, sentence (73), which has v-unaccusative, allows the co-occurrence of the XP1 *from the earthquake*, the XP2 *onto the floor*, and the XP3 *into pieces*.

3.5. Direct/Indirect Causation

In the hierarchical event structure theory, a causal relation between two events is crucially determined by their relative hierarchy. When an XP is situated immediately above a V that denotes a change of state, then the XP evokes the direct cause of the change of state, as in (74). That is, the event evoked by the XP in (74) directly causes the event evoked by the V. When this XP is positioned above another XP, below which the V is situated, the former XP evokes the indirect cause of the change of state (i.e., the event evoked by the former XP does not directly cause the event evoked by the V), whereas the latter XP evokes its direct cause, as in (75). In this case, the former XP (i.e., XP1 in (75)) expresses the indirect cause of the change of state because this XP is situated above V and another XP (i.e., XP2 in (75)), and the interpretation of this hierarchical syntactic structure is that ‘the event of XP1 causes an event in which the event of XP2 causes the event of V.’

(74) [[V] XP]

- a. XP: the direct cause of an event of V
- b. V: a change of state

(75) [[[V] XP2] XP1]

- a. XP1: the indirect cause of an event of V
- b. XP2 : the direct cause of an event of V
- c. V: a change of state

In this subsection, I provide empirical evidence for the difference between a direct and an indirect cause that is determined by the relative hierarchy of event-denoting expressions.

First, let us examine the case in (74). Suppose that XP1 is the PP *with his right hand* and V is *break*, and no event-denoting expression intervenes between them. In this case, the

event of XP1 is the direct cause of the event of V, as illustrated in (76):

- (76) a. John broke the statue with his right hand.
b. [[V] XP1]
c. Meaning: John broke the statue by hitting it with his right hand.
d. *with his right hand*: direct causation.

Similarly, when XP2 is the PP *onto the floor* and V is *break*, and the PP is immediately above the V in terms of the hierarchy of event structure, XP2 serves as the direct cause of the event of V, as shown in (77):¹⁶

- (77) a. John broke the statue onto the floor.
b. [[V] XP2]
c. Meaning: John broke the statue by dropping it onto the floor.
d. *onto the floor*: direct causation

Next, let us exemplify (75). Suppose that XP1, XP2 and V are *with his right hand*, *onto the floor* and *break*, respectively. In this case, XP2, which is immediately above V, intervenes between XP1 and V. Consequently, XP2 evokes the direct cause of the event denoted by V, and XP1 expresses its indirect cause, as shown in (78):

- (78) a. John broke the statue onto the floor with his right hand.
b. [[[V] XP2] XP1]

¹⁶ Of course, the XP2 is ambiguous between two readings in which it denotes a causing event and in which it and V refer to the identical event; the XP2 can denote either reading as long as it can be interpreted appropriately.

- c. Meaning: John broke the statue by dropping it onto the floor with his right hand.
- d. *onto the floor*: direct causation, *with his right hand*: indirect causation

In this way, the relative hierarchy of event-denoting expressions is reflected in the differences of their interpretations, empirically confirming the hierarchical event structure theory.

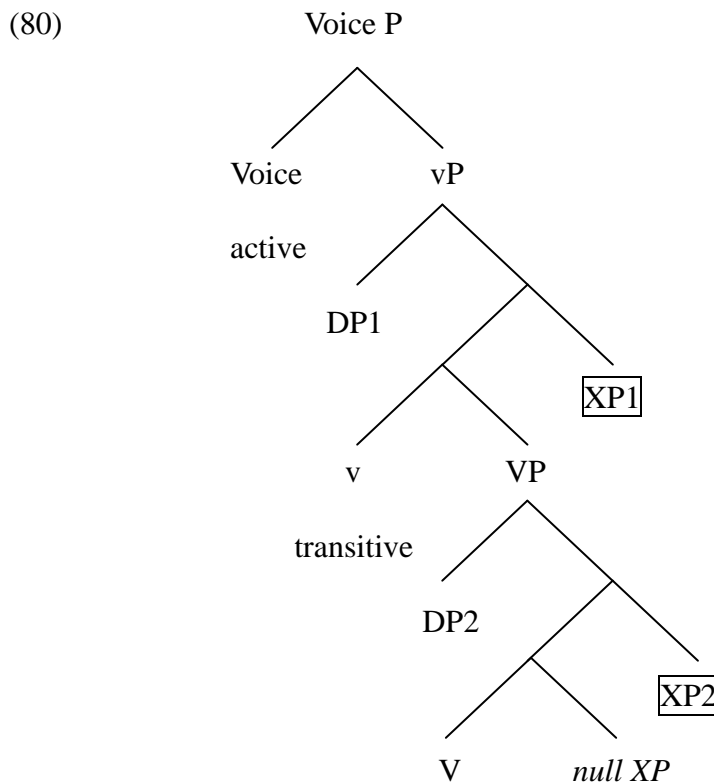
3.6. Predication

This subsection demonstrates that predicational relations between arguments and predicates also provide evidence for the hierarchical event structure theory. Section 3.6.1 shows that the XP1 and the XP2 are predicated of distinct arguments when they occur in a transitive sentence, in accordance with my analysis. Section 3.6.2 is concerned with the co-occurrence restriction of a change of state verb and a result phrase, which naturally follows because the XP3 and a change of state V must refer to an identical event, as predicted in my analysis. Section 3.6.3 argues for the existence of an implicit external argument in the specifier position of v-transitive with passive Voice.

3.6.1. Predication and Causal Relation

Event-denoting expressions that occur in XP1 or XP2 share a causal meaning because they may serve to be a (direct or indirect) cause of the event of V (and/or XP3). XP1 and XP2 are, however, crucially different in the position of their occurrence: XP1 occurs in vP, whereas XP2 appears in VP. Note that in a transitive sentence, XP1 is c-commanded by the external argument, whereas XP2 is c-commanded by the internal argument. This syntactic difference between XP1 and XP2 is systematically associated with the difference of their predicational interpretations. Observe the following data:

- (79) a. John broke the vase with a hammer.
 b. John broke the vase onto the floor.



The XP1 *with a hammer* is adjoined to a vP, while the XP2 *onto the floor* is situated in a VP, as illustrated in (80). This syntactic difference appears as the semantic difference; the XP2 *onto the floor* serves to be predicated of the internal argument *the vase*, whereas the XP1 *with a hammer* is predicated of the external argument *John*, as in (81):

- (81) a. John (hit the vase) with a hammer. (cf. (79a))
 b. The vase (went) onto the floor. (cf. (79b))

In this way, there is a predication relation between the external argument *John* and the XP1 *with a hammer* and between the internal argument *the vase* and the XP2 *onto the*

floor.^{17,18,19,20}

Causal interpretations are also involved in (79a) and (79b). In (79a), as we have seen in (81a), the external argument serves to saturate the predicate XP1, and they form an event. In addition, V also takes the part of being predicated of the internal argument, and they constitute an event. Consequently, two distinct events emerge. Because the XP1 c-commands the XP2, the event denoted by the former is hierarchically higher than that denoted by the latter. As a result, a causal relation follows between the two events, as shown by the interpretation in (82):

- (82) [the event of John hitting the vase with a hammer]
CAUSE [the event of the vase becoming broken] (cf. (79a))

The XP2 *onto the floor* in (79b), on the other hand, is predicated of the internal argument. Furthermore, V is also saturated by the internal argument. For the external argument, I assume that v serves to be predicated of it, denoting some action by an agent. As a result, sentence (79b) can be interpreted as follows:

- (83) [the event of John doing something]

¹⁷ Pascual (2001) also analyzes instrument PPs as predicates.

¹⁸ Lönngren (1999:78) states that the following sentences implicitly include one predicate in addition to the explicit verb break:

- (i) a. John broke the vase with a hammer.
b. John broke the vase against the wall.

Lönngren observes that the preposition *with* is synonymous with the verb *use* in (ia). Furthermore, Lönngren states that an implicit predicate such as *throw* is involved in (ib).

¹⁹ Gawron (1986) calls prepositions such as *against* in *John broke the vase against the wall* as co-predicators, because the verb *break* and the preposition *against* are both predicated of the same argument *the vase*.

²⁰ I assume that causer PPs such as *from the earthquake* also serve as predicates. Prepositions are inherently relational in that they require two objects. For example, the preposition *on* describes a relation between the two objects, the book and the table, in *the book on the table*. I suppose that the preposition *from* in *the vase broke from the earthquake* is also relational, describing some relation between the vase and the earthquake.

CAUSE [[the event of the vase dropping onto the floor]

CAUSE [the event of the vase becoming broken]

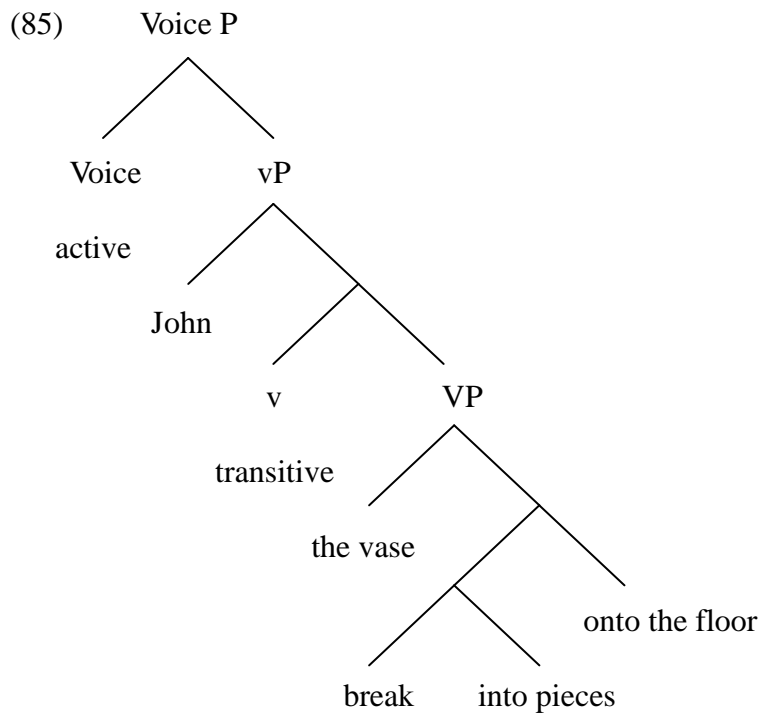
(cf. (79b))

In this way, XP1 and XP2, which are attached to distinct syntactic positions, are systematically associated with distinct interpretations. The systematic association between distinct XPs and their interpretations provide further evidence for the hierarchical analysis of event-denoting expressions.

3.6.2. Predication and Further Specification

In the previous subsection, we saw that V and XP2 function as the predicates of the internal argument because they are both c-commanded by the latter. In addition to the XP2, the XP3 may also serve to be predicated of the internal argument. Observe the following sentence:

(84) John broke the vase into pieces onto the floor.



Sentence (84) involves the three predicates *onto the floor*, *into pieces* and *break*, all of which are situated in VP, and they are c-commanded by the internal argument *the vase*. As a result, all three predicates can be saturated by the argument, forming three events. Note that the XP2 *onto the floor* is hierarchically higher than the other two predicates, whereas the XP3 *into pieces* and the V *break* are in a local syntactic relation of mutual c-command. This means the V and the XP3 may denote an identical event, while the XP2 must refer to an event that causes the event of the V and XP3. The interpretation of sentence (84) is as follows:

- (86) [the event of John doing something]
CAUSE [[the event of the vase dropping onto the floor]
CAUSE [the event of the vase becoming broken into pieces]]

The XP2 *onto the floor* evokes a cause of the event of the vase becoming broken into pieces because it is positioned higher than *break* and *into pieces*. The latter two predicates evoke the identical event because they are in a non-asymmetric relation.

3.6.3. Predication in Passive Voice

Following Merchant (2013), I assume that v-transitive always includes an external argument in its specifier position, regardless of Voice types, implicitly or explicitly. This assumption can successfully account for the distribution of instrument PPs, which must be c-commanded by an (Agent) external argument because we assume that the instrument PPs serve as incomplete predicates.

Observe the following sentence:

- (88) The vase was broken with a hammer by John. (Brunson (1993:22))

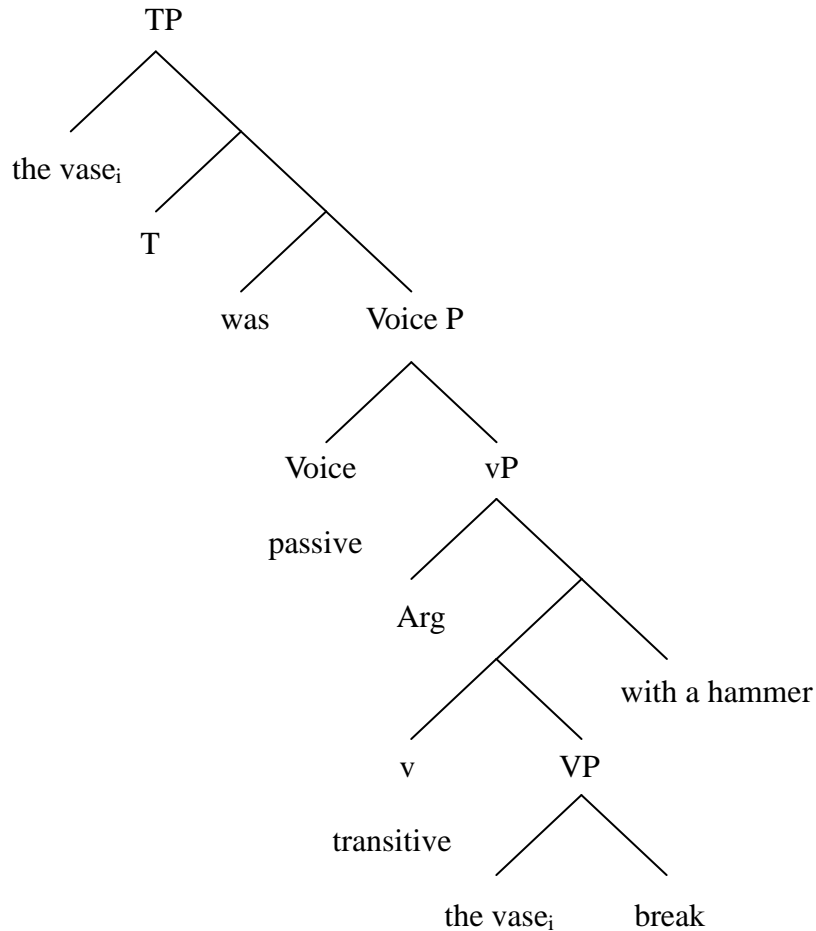
In this sentence, the instrument PP *with a hammer* occurs in passive Voice. At first glance, the DP *John* seems to license the occurrence of the PP. Intuitively, this analysis seems to be tenable because there is a predicational relation between *John* and the instrument PP *with a hammer*. Note, however, that the DP is embedded in the PP *by John*, and the DP cannot c-command the instrument PP. This means that the DP and the instrument PP cannot hold a *direct* predicational relation. Furthermore, the instrument PP appears to be c-commanded by the DP *the vase*.

(89) The vase was broken with a hammer.

In this sentence, no Agent argument occurs explicitly, so the DP *the vase* appears to c-command the instrument PP *with a hammer*, an apparent problem.

This apparent problem can be resolved if we assume that v-transitive always includes an external argument in its specifier position regardless of Voice types. In the following tree, I suppress some structural details for simplicity, such as the adjunction site of *by John*. The subscript in the tree indicates that *the vase* in VP and that in TP are copies.

(90)



As shown in the tree, the instrument PP is immediately c-commanded by the implicit argument *Arg*. I assume that *Arg* can be co-referential with the DP *John* in the PP *by John*. Consequently, the instrument PP *with a hammer* can be predicated of the DP *John* indirectly.

3.7. The Mediation Constraint

It has been observed that the referent of the subject argument of a lexical causative verb has to be the direct cause of the event of the verb (Shibatani (1976), Goldberg (1995), Schlesinger (1995), Rappaport and Levin (2001), etc.). The unacceptability of sentence (91b) follows because the subject argument *the wind* cannot be the direct cause of breaking the vase due to the existence of the XP1 *with a twig*. In this sentence, the twig is the direct cause of the change of state.

- (91) a. The wind broke the window.
 b. * The wind broke the window with a twig.

(Schlesinger (1995:96))

- cf. John broke the window with a hammer.

The same restriction holds of XP2 as well because it also evokes the cause of a result event.

- (92) * The wind shattered the vase onto the floor.
 cf. John shattered the vase onto the floor.

The breaking of the vase is directly caused by its motion onto the floor, but not the force of the wind. Thus, the referent of the subject argument in this sentence cannot be the direct cause.

The parallel behavior between (91b) and (92) strongly suggests that XP1 or XP2 serves as the direct cause of a result event when no other event intervenes between them.

3.8. Modifications by *Again*

Modifications by *again* also point to the analysis I have proposed in this thesis. When the adverb *again* precedes the XP1 *with a hammer*, the XP obligatorily takes a wide scope over the adverb and vice versa (cf. Beck and Johnson (2004) and Merchant (2013)).

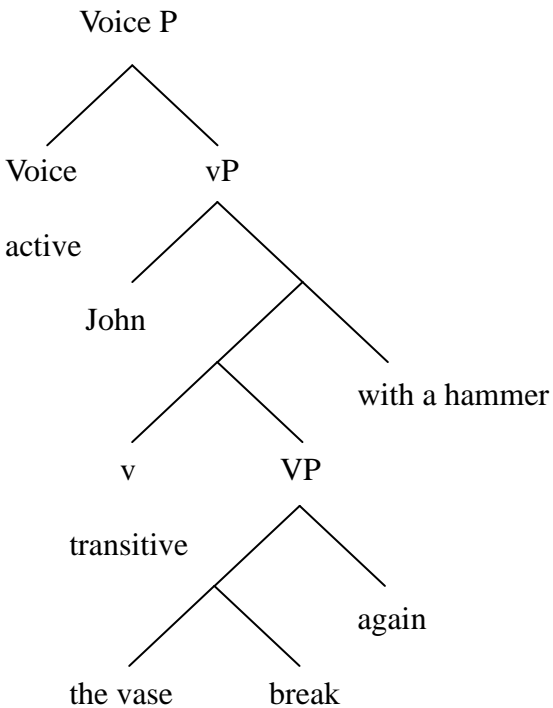
- (93) John broke the vase again with a hammer. (XP1 > again)

- (94) John broke the vase with a hammer again. (again > XP1)

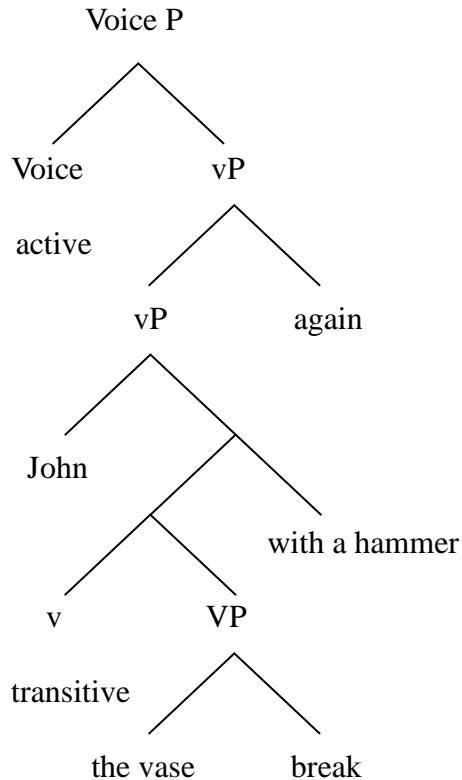
In sentence (93), breaking the vase was repeated twice (e.g., John broke the vase with a bat.

He repaired it. Finally, he broke it with a hammer.). In sentence (94), on the other hand, breaking the vase with a hammer was repeated twice (e.g., John broke the vase with a hammer. He repaired it. Finally, he broke it with a hammer.). This contrast in scope interpretation suggests that the position of the XP1 is higher than the V, and this structural relation triggers a causal relation between the event of the XP1 and that of the V. The structures of (93) and (94) are represented in (93') and (94'), respectively.

(93')



(94')



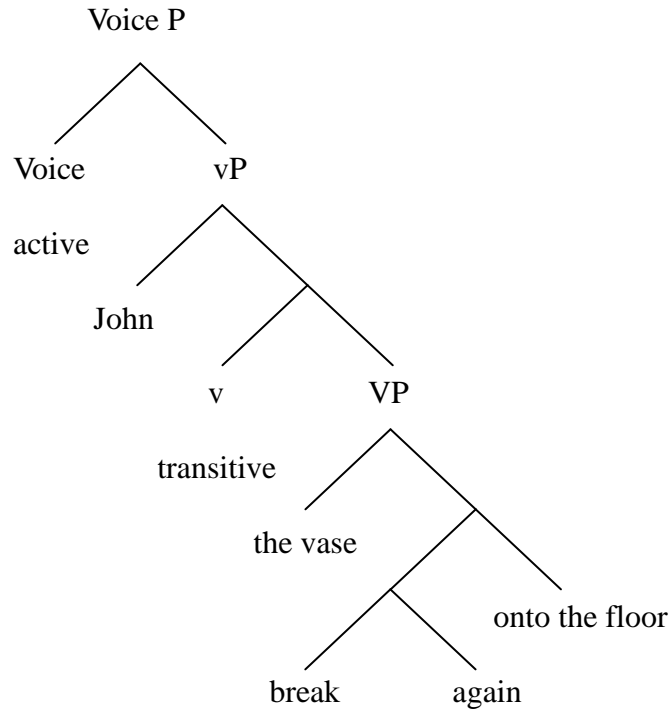
Likewise, the adverb *again* obligatorily takes wide scope over the XP2 *onto the floor* when the former precedes the latter, and vice versa. This fact suggests that the XP2 is also positioned above the V.

(95) John broke the vase again onto the floor. (XP2 > again)

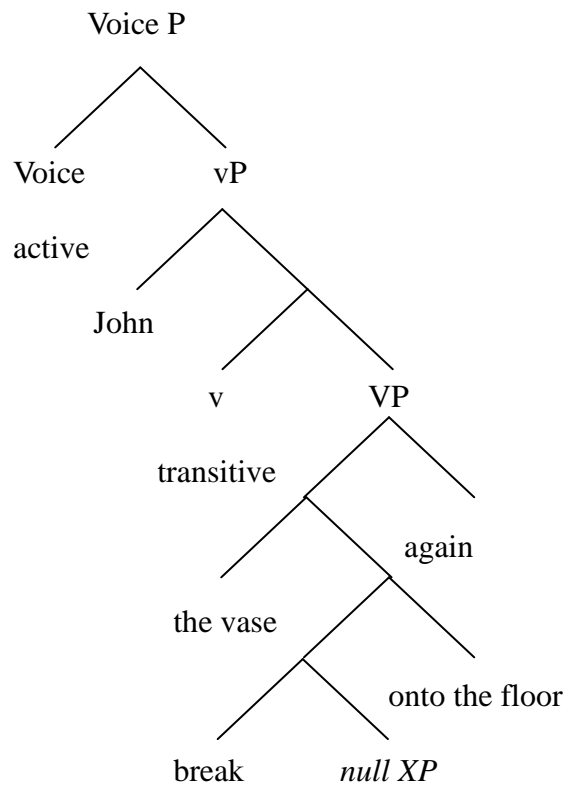
(96) John broke the vase onto the floor again. (again > XP2)

Sentence (95) is acceptable in the interpretation in which the event of breaking the vase was repeated twice (e.g., John broke the vase with a bat. He repaired it. Finally, he broke it onto the floor.). Sentence (96), on the other hand, implies that the event of breaking the vase onto the floor was repeated twice (e.g., John broke the vase onto the floor. He repaired it. Finally, he broke it onto the floor.). The structures in (95') and (96') represent the structures of sentences (95) and (96), respectively.

(95')



(96')



3.9. Semantic Restrictions

Although the positions of XP1 and XP2 are syntactically distinct, they are both situated above V and XP3. This hierarchical relation means that the former XPs are causally related to the

latter event-denoting elements. The following representations show that either the event evoked by XP1 or XP2, if they do not co-occur, can be the direct cause of the event denoted by V. E indicates an event.

- (97) a. $E_V < E_{XP1}$
b. $E_V \leq E_{XP2}$

Although XP1 and XP2 are adjoined to distinct syntactic positions, they can evoke the direct causing event of the result event equally, if they do not co-occur. In this subsection, we observe three restrictions concerned with XPs, and I show that they naturally follow from the shared causal interpretation of XP1 and XP2 that comes from (97).

3.9.1. Coordination Restriction

Generally, the co-ordination of two constituents is possible when they share the semantic (and syntactic) properties. Thus, the sentence in (98) is acceptable.

- (98) Did he break the vase with a hammer or with a stone?

In this sentence, the two instrument PPs are coordinated.

XP1 and XP2 also share semantic properties. The events evoked by XP1 and XP2 are equally related to the event of V in terms of causality in (97); the event expressed by XP1 directly causes the event of V in (97a), and so does the event of XP2 in (97b).²¹ As a result, they can be coordinated.

²¹ Of course, shared syntactic properties are also required for the co-ordination. In this case, both XP1 and XP2 are adjunct PPs sharing the syntactic property.

- (99) a. Did he break the vase onto the floor or with a hammer?
b. Did he break the vase with a hammer or onto the floor?

On the other hand, we can predict that the co-ordination of XP1 and XP3 is not allowed because they do not share semantic properties in relation to V; the event of XP1 is causally related to that of V, whereas XP3 and V refer to an identical event. This prediction is borne out by the following data:

- (100) a. ? Did he break the vase into pieces or with a hammer?
b. ? Did he break the vase with a hammer or into pieces?

These data show that the co-ordination of the XP1 *with a hammer* and XP3 *into pieces* is not possible.

3.9.2. Co-occurrence Restriction

XP1 and XP2 can denote the direct causing event of the result event when they do not co-occur in a single clause.

- (101) a. John broke the statue onto the ground.
b. John broke the statue with a hammer.

The XP1 and XP2 in the sentences in (101) evoke the direct causing event of the result event denoted by the verb *break*. Because the interpretation of direct causation is read off from the hierarchical relations (i.e., only an XP that immediately c-commands the event-denoting element of a result event can be construed as the direct causing event), both XPs cannot serve

to evoke a direct causing event at the same time (see also section 3.5). As a result, we can predict that XP1 and XP2 cannot co-occur in a single clause when they retain the direct causation interpretations. This prediction is borne out by the following sentence.

(102) * John broke the statue onto the ground with a hammer.

This sentence is not acceptable in the interpretation in which the events evoked by the XP1 *with a hammer* and the XP2 *onto the ground* both denote the direct causing events of the result event.

3.9.3. Direct Causation Restriction

When two event-denoting elements co-occur in a single clause, they must be in a direct causal relation (or in a further specification relation), as indicated in (97). For this reason, the sentences in (103b) and (104b) are not acceptable.

(103) (Situation: John hit the ball with a bat, and the ball shattered the vase.)

- a. John shattered the vase with a ball.
- b. # John shattered the vase with a bat.

(104) (Situation: John broke the vase by dropping it onto the floor.)

- a. John broke the vase onto the floor.
- b. * John broke the vase toward the floor.

As the situations described in these sentences tell us, the XPs in the (a) sentences evoke the direct causing event, and no infelicity results. In the (b) sentences, on the other hand, the XPs do not evoke the direct causing event. In (103b), John did not shatter the vase by hitting it

with a bat. Likewise, in (104b) the XP2 *toward the floor* does not entail physical contact between the vase and the floor, so it does not serve to indicate the direct cause of breaking the vase.

In this way, all three semantic restrictions concerned with XPs automatically follow from the causal interpretations read off from the hierarchical event structure.

3.10. Interim Conclusion

In summary, this section has shown that the hierarchical event structure theory is supported by various empirical consequences, including the compatibility of each XP with each feature setting on *v* across Voice types, the possible orders of XPs, the co-occurrence of XPs, constituency tests, the investigation of direct/indirect causation, predication, the Mediation Constraint effect, modifications by *again*, and three semantic restrictions.

4. Concluding Remarks

In this chapter, I have proposed the hierarchical event structure theory, and provided theoretical as well as empirical motivation for the theory. The remainder of this thesis gives a unified account of the following phenomena, the co-occurrence restriction of a change of state expression and a change of location expression in a single clause (i.e., the Unique Path Constraint effect), argument realizations concerning emission verbs and disappearance verbs, and the occurrence of path phrases with motion verbs. All these phenomena are closely related to the causality and identity of events, and therefore, they strongly support the empirical validity of the hierarchical event structure theory.

Appendix: Depictives

In this thesis, we refer to the phrases in italics in (1) as event-denoting expressions or elements. The term “event-denoting” is contrasted with “state-denoting.” The former expressions denote dynamic events, whereas the latter expressions evoke non-dynamic events. State-denoting elements are exemplified by the so-called depictives, as shown in (2), which is cited from Rothstein (2004:60).

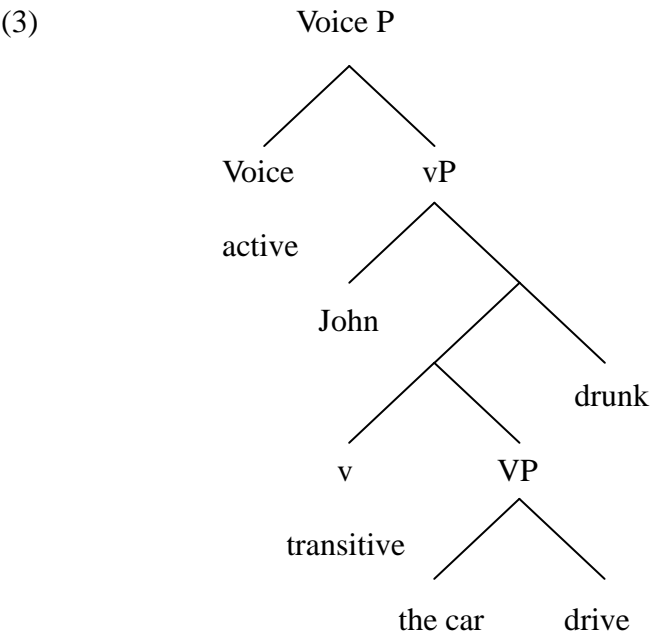
- (1) a. John broke the vase *with a hammer*.
b. John broke the vase *onto the floor*.
c. John broke the vase *into pieces*.
- (2) a. John_i drove the car drunk_i.
b. Mary drank the coffee_i hot_i.

The two event structural relations, causality and identity, are relevant to the events that are evoked by the event-denoting elements, but not the state-denoting elements. As a result, no causality or identity between events denoted by the predicate *drive* or *drink* and the depictives *drunk* or *hot* follows in (2). For example, in (2a), John’s driving the car is not caused by his being drunk nor can the two events be construed as an identical event.

Although depictives do not evoke dynamic events, I assume that the licensing of depictives is also governed by the local syntactic relation of c-command; event-denoting elements and depictives share the mechanism of licensing the predicates, except that the latter does not evoke any relation between events. On the basis of this assumption, we can predict that (i) some depictives are adjoined to VP internal positions, whereas others are adjoined to vP internal positions, in parallel with the event-denoting elements; (ii) depictives can be predicated of an implicit external argument in passive sentences in the same way as the

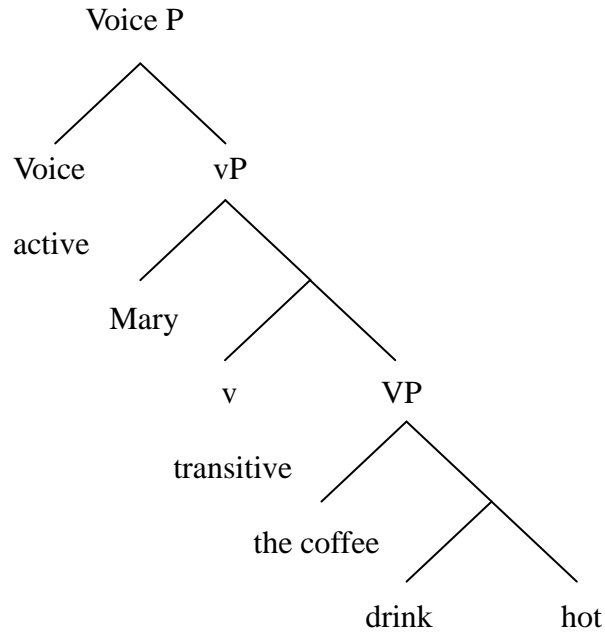
event-denoting elements; and (iii) subject-oriented depictives must follow object-oriented depictives when they co-occur in a single clause, in accordance with the co-occurrences of XP1 and XP2 or XP3. I show that the three predictions are borne out.

Let us consider the first prediction. Because the depictives *drunk* in (2a) and *hot* in (2b) are predicated of the subject and the object, respectively, I assume that the former is adjoined to vP, while the latter is attached to VP. Consequently, the following tree structures are obtained.



(cf. (2a))

(4)



(cf. (2b))

The following constituency test shows that the subject-oriented depictive can be stranded by the pro-form *did*, while the object-oriented one cannot.

- (5) a. What Mary did drunk was paint the house.
b. * What Mary did hot was drink the coffee.

(Rothstein (2004:61))

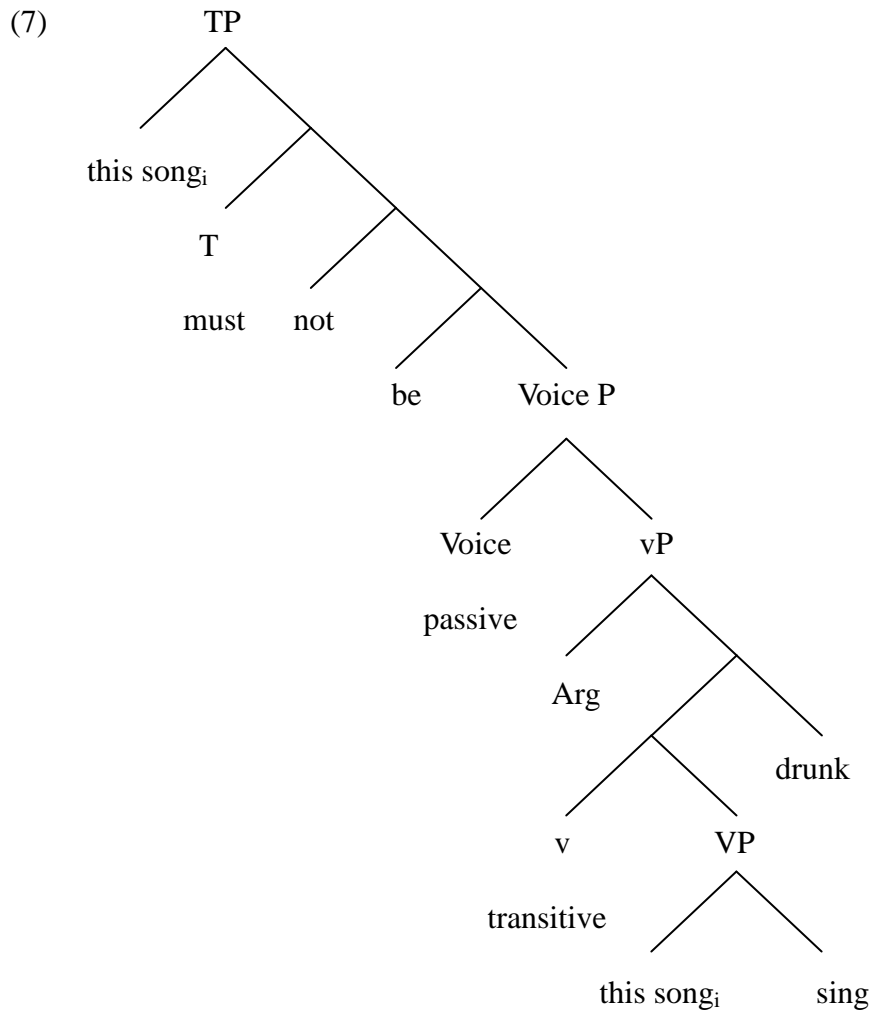
The second prediction can be confirmed by the following examples:

- (6) a. This song must not be sung drunk.
b. Such petitions should be presented kneeling.

(Baker (1988:318))

In these sentences, the depictives *drunk* and *kneeling* are predicated of an implicit argument,

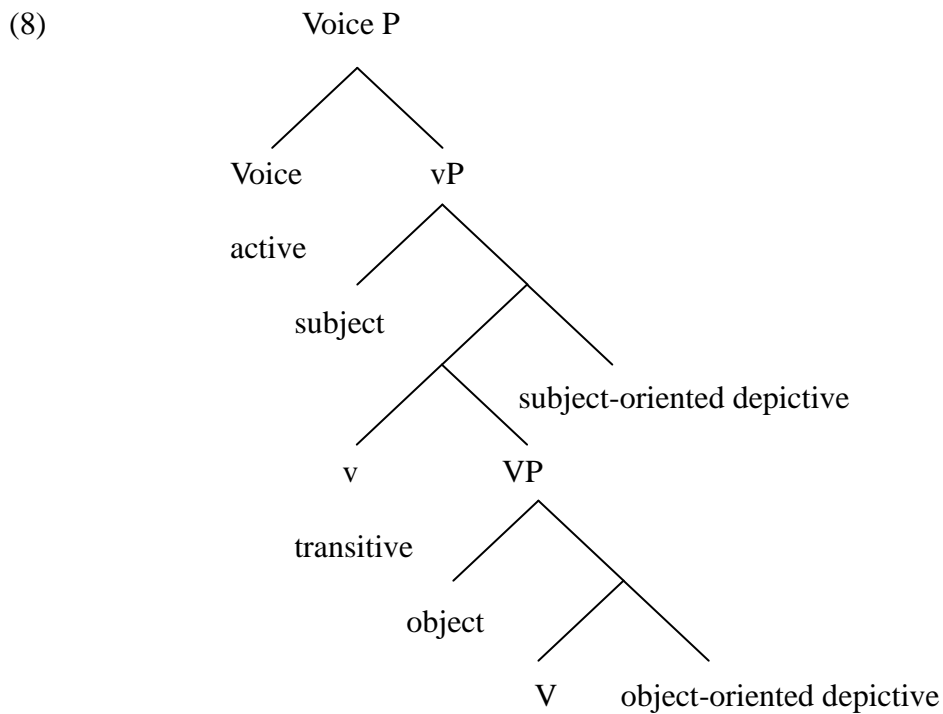
but not the overt subject. This fact naturally follows if we assume that v-transitive with passive Voice also includes an implicit external argument in its specifier position. Take (6a) for example:



In this tree, I suppress some structural details for simplicity, such as the projection of *be* and negation. The subscript in the tree indicates that *this song* in vP and that in TP are copies. Note that *Arg* in the specifier position of vP immediately c-commands the depictive *drunk*. This structural analysis allows correct predicational relation between the implicit argument and the depictive.

Finally, we can predict that subject-oriented depictives must follow object-oriented ones

because the former are positioned in vP, whereas the latter are adjoined to VP.



This prediction is supported by the following contrast:

- (9) a. John_i sketched the model_j [nude]_j [drunk as a skunk]_i.
 b. * John_i sketched the model_j [nude]_i [drunk as a skunk]_j.

(Carrier and Randall (1992:221))

In these sentences, the subscripts attached to the depictives show that they are predicated of the NPs with the same subscripts. In sentence (9a), the subject-oriented depictive follows the object-oriented one. In sentence (9b), on the other hand, the subject-oriented depictive precedes the object-oriented one, and this sentence is unacceptable.

In this way, I have shown that there are two types of predicates: event-denoting elements and state-denoting elements. Although only the former are relevant to causal or

identical relations between events, they nevertheless share the syntactic mechanism that licenses their occurrences. Although I believe that the syntactic mechanism of predication developed in this thesis can cover broader phenomena than we have observed here, I leave further investigations for future research.

Chapter 3

A Closer Look at the Unique Path Constraint Effect (1): Spatial Extension

It has been argued that there is a co-occurrence restriction of a change of state expression and a change of location expression in a single clause. In this thesis, I argue that this co-occurrence restriction comes from the hierarchical event structure theory. This chapter and the next show that a change of state expression and a change of location expression can co-occur in a single clause when they refer to the unified change in terms of the change of spatial extent. This effect follows from the identity of events in the hierarchical event structure theory. However, I do not mean that the co-occurrence of these expressions is always impossible when they do not refer to such changes. Chapter 5 argues that the causality of events also allows the co-occurrence of a change of state expression and a change of location expression in a single clause. Crucially, the co-occurrence restriction effect I discuss in chapters 3 through 5 is predictable in the hierarchical event structure theory.

1. Introduction

It has been argued that a single clause may not involve both a change of state expression and a change of location expression (Simpson (1983), Goldberg (1991, 1995), Levin and Rappaport (1995), Tortora (1998), Matsumoto (2006), among others). This restriction is known as the Unique Path Constraint (henceforth, the UPC) and is formulated in the following way (Goldberg (1991:368):

- (1) **Unique Path Constraint:** if an argument X refers to a physical object, then more

than one distinct path cannot be predicated of X within a single clause.

The UPC prohibits multiple expressions that denote distinct paths from co-occurring in a single clause. Goldberg argues that a result phrase and a path phrase may not co-occur in a single clause in (3) because their co-occurrence violates the UPC.¹

- (2) a. Sam kicked Bill black and blue.
- b. Sam kicked Bill out of the room.
- (3) a. * Sam kicked Bill black and blue out of the room.
- b. * Sam kicked Bill out of the room black and blue.

(Goldberg (1991:368))

The result phrase *black and blue* in sentence (2a) exhibits a change of state of the referent denoted by the object NP *Bill*. Likewise, the path phrase *out of the room* in sentence (2b) expresses a change of the location of *Bill*. Goldberg argues that the result and path phrases exhibit two distinct paths; the co-occurrence of the result phrase and the path phrase in a single clause violates the UPC, as in (3).

This co-occurrence restriction has been formulated in various ways in the literature (e.g., Single Delimiting Constraint (Tenny (1994)), Further Specification Constraint (Tortora (1998)), and Single Development Constraint (Matsumoto (2006))). All these analyses share

¹ Goldberg (1991:368) notes that the notion of a single path entails both of the following conditions:

- (i) X cannot be predicated to move to two distinct locations at any given time *t*.
- (ii) The motion must trace a path within a single landscape.

Goldberg explicitly states that the UPC bans the co-occurrence of a change of state expression and a change of location expression in a single clause when the change of state and the change of location occur at the same time. As chapter 5 shows, however, the formulation of the UPC on the basis of simultaneity is inadequate. Furthermore, Goldberg herself does not take the notion of simultaneity into account in her discussion of the examples in (4), which are apparently problematic for the UPC. For these reasons, I do not mention the notion of simultaneity in this thesis.

the insight that a single clause may express only one event or one change, in parallel fashion with the UPC.

Rappaport and Levin (1998) suggest that the UPC effect follows from the nature of the event structure. In their event structure system, two distinct changes of state and of location are prohibited from co-occurring in the single result event, accounting for the infelicity of (3). Crucially, this insight underlies the system of hierarchical event structure. In my system, each event, including the result event, may involve only one change. More than one change can be associated with one event if and only if they are in a further specification relation, denoting a single change. In this way, the UPC effect is in conformity with the hierarchical event structure theory.

This event structural account, however, appears to face empirical problems. The following examples, which are noted by many researchers (Goldberg (1995, 2001), Levin and Rappaport (1995), Filip (2003), Matsumoto (2006), Okuno (2003)), appear to violate the UPC:

- (4) a. The butcher sliced the salami onto the wax paper.
- b. Joey grated the cheese onto a serving plate.
- c. Sam shredded the papers into the garbage pail.

(Goldberg (1995:171))

- (5) a. The cook cracked the eggs into the glass.

- b. Daphne shelled the peas onto the plate. (Levin and Rappaport (1995:60))

- (6) Kelly broke the branch off the tree. (Rappaport and Levin (1998:123))

All these sentences include matrix verbs denoting a change of state of the objects, which can be considered paths in terms of a change of state. Furthermore, they contain path phrases,

displaying paths in terms of literal motion. Consequently, two distinct paths co-occur in a single clause in these sentences. In this way, these sentences appear to violate the UPC, and they could cast doubt on the validity of the event-based account.

Several previous studies have attempted to resolve these empirical problems (pragmatic conditions (Goldberg (1995, 2001)), the polysemy-based approach (Levin and Rappaport (1995)) and the Single Development Constraint account (Matsumoto (2006))). These approaches, however, prove inadequate, as I discuss in section 6.

In this chapter, I argue that the UPC effect automatically follows from the nature of the hierarchical event structure. I argue that the examples in (4)-(6), which are supposed to be counterexamples to the UPC by many researchers, are apparent counterexamples. Although these sentences appear to contain two distinct paths, it is shown that one path further specifies the other; that is, the former specifies the underspecified part of the meaning of the latter. Specifically, it is shown that path phrases can further specify a change of state denoted by verbs when the path phrases refer to the motion of only part of an object, which I call anchored motion. As a result, the two paths in these sentences constitute a unique path, and no UPC violation arises. This analysis is compatible with the event structure analysis, confirming its validity.

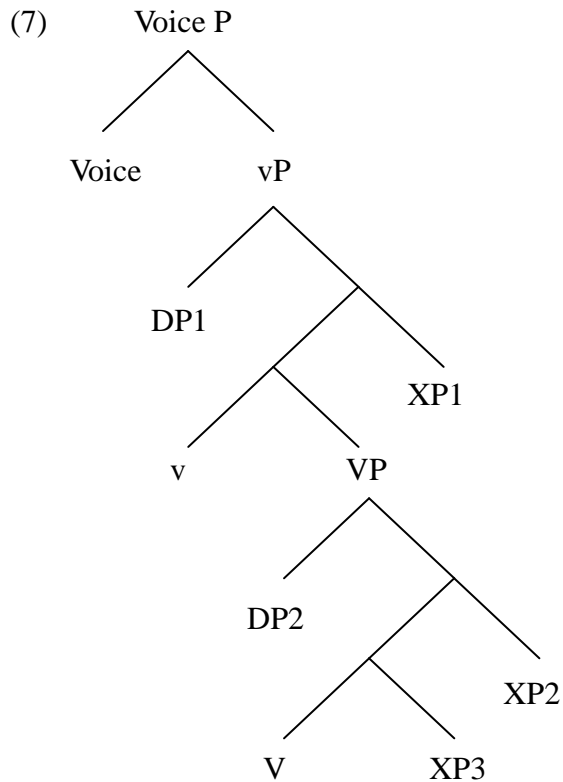
The organization of this chapter is as follows. First, section 2 presents an event structure analysis of the UPC effect. Crucially, my analysis predicts that the result events may involve more than one change when they are in a further specification relation. Section 3 shows that path phrases that denote a motion in which only part of an object moves along a path may further specify the change of state exhibited by verbs. On the basis of this observation, section 4 argues that the path phrases in (4)-(6) further specify the change of state denoted by the verbs. As a result, the change of state and change of location in these sentences form a unique change of state, and no UPC violation arises. Section 5 shows that

my explanation is widely applicable to other phenomena. Section 6 critically reviews previous approaches to the UPC effect, showing the theoretical as well as empirical validity of my event structure analysis. Section 7 argues that the event-based analysis of the UPC effect is universally applicable by showing that the same mechanism underlies and constrains Japanese V-V compound formations. Finally, section 7 presents concluding remarks.

2. An Event-based Account of the UPC Effect

In this section, I argue that the co-occurrence restriction on a change of state expression and a change of location expression follows from the event structural restriction that prohibits a single event from involving two distinct results. Based on the event structure analysis, I argue that a change of state denoted by the verbs and motion expressed by the path phrases in (4)-(6) constitute a single unified result in which the path phrases further specify the change of state of the verbs. This analysis is in accordance with Goldberg's (1991) observation that the UPC does not rule out a co-occurrence of a change of state expression and a change of location expression in a single clause when the latter further specifies the former.

Under the hierarchical event structure theory, I assume that a result event is evoked by a verb and XP3. The two event-denoting expressions are in a local syntactic relation of mutual c-command. This syntactic relation means they express an identical event, i.e., they are in a further specification relation.



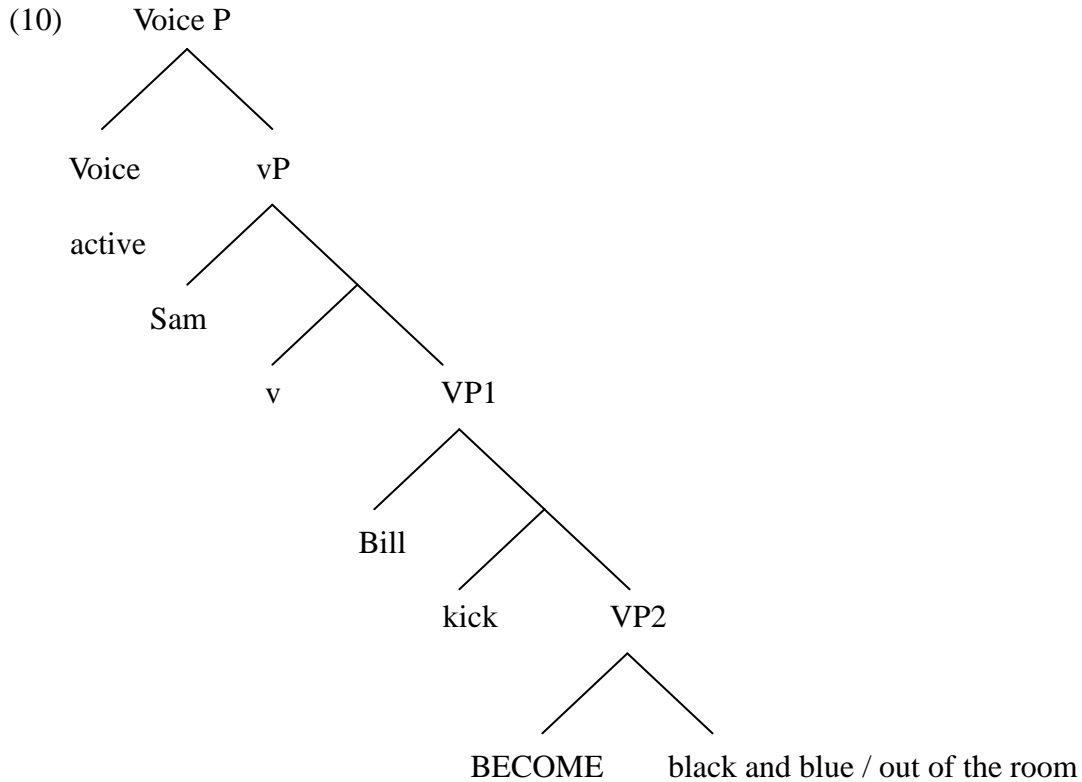
(8) [[[[V XP3] XP2] XP1]...]

- a. asymmetric relation: causality
- b. non-asymmetric relation: identity

The unacceptability of (3) immediately follows from the system, because the result phrase *black and blue* and the path phrase *out of the room* both evoke two distinct result events that are not in a further specification relation.

- (9) a. * Sam kicked Bill black and blue out of the room.
 b. * Sam kicked Bill out of the room black and blue.

(= (3))



In this structure, the verb *kick* is base-generated in the head of VP1, and raises to v. Further, I assume that the structure of resultative constructions or caused motion constructions of *kick* involves an empty verb BECOME (Kaga (2007)), which semantically correspond to the lexical verb *become* or *go*. The addition of the empty head BECOME allows the asymmetric relation between the event of kicking Bill and that of his becoming black and blue or his going out of the room. The analysis in which the events evoked by the XP3s express result events can be confirmed by the following paraphrases:

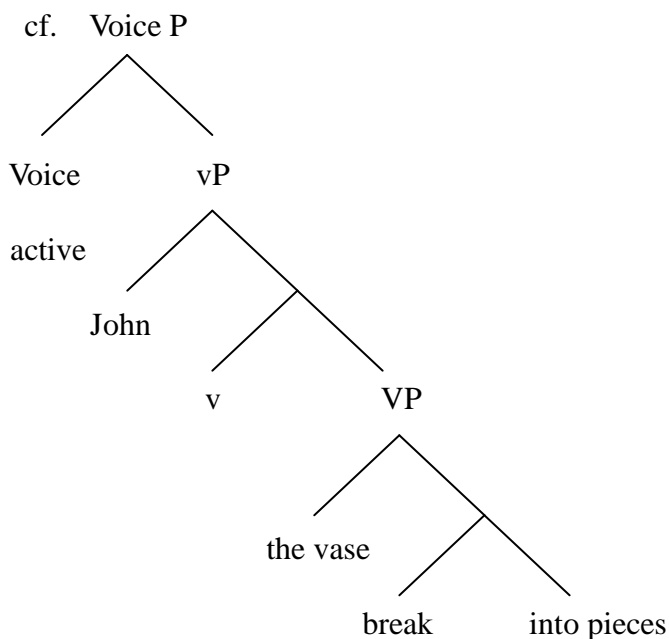
- (11) a. Sam kicked Bill black and blue. (= (2a))
 b. Sam made Bill black and blue by kicking him.
- (12) a. Sam kicked Bill out of the room. (= (2b))
 b. Sam caused Bill to go out of the room by kicking him.

The sentences in (11a) and (12a) can be paraphrased by (11b) and (12b), respectively. These paraphrases show that the change of state (Bill's becoming black and blue) and the change of location (Bill's going out of the room) are both caused by Sam's kicking. That is, Sam's kicking is a causing event, and Bill's change of state and change of location are result events.

By contrast, the two event-denoting expressions V and XP3 are predicted to be compatible when they are in a further specification relation. This prediction is confirmed by the following sentences:

(13) a. The bottle broke open. (Levin and Rappaport (1995:59))

b. John broke the vase into pieces.



These sentences involve the verb *break* and the XP3 *open* or *into pieces*. The co-occurrence of the verb and the XP3 is allowed because the XP3 further specifies the meaning of the verb (Tortora (1998)). Although these sentences include two event-denoting expressions, the two expressions point to the single unified change, and therefore, no UPC violation results. The tree structure above is the representation of sentence (13b).

In this way, the UPC effect follows from the hierarchical event structure theory. The examples in (4)-(6), repeated here as (14)-(16), however, appear to pose a serious problem for this account:

- (14) a. The butcher sliced the salami onto the wax paper.
- b. Joey grated the cheese onto a serving plate.
- c. Sam shredded the papers into the garbage pail.
- (15) a. The cook cracked the eggs into the glass.
- b. Daphne shelled the peas onto the plate.
- (16) Kelly broke the branch off the tree.

These sentences include a change of state verb and a path phrase in a single clause and apparently contain two distinct paths in terms of change of state and change of location.

Assuming that my event structural account of the UPC effect is on the right track, a change of state denoted by the verbs and a change of location expressed by the path phrases in these sentences should be involved in the same result events; that is, the path phrases further specify the meaning of the verbs in the same way as the result phrases in (11) and (12). I provide evidence for this account by arguing that a certain type of path phrase may further specify the meaning of change of state verbs, which is discussed in the next section.

3. Motion Involved in Change of Spatial Extent

In section 3.1, I survey Goldberg (1991) and Lindner (1982, 1983), who discuss the co-occurrence of a change of state expression and a change of location expression in terms of further specification. Their analyses are mainly based on sentences denoting change of physical shape and position. In section 3.2, I propose that their analyses are applicable to

change of state in terms of physical separation and combination. The argument presented in this section allows us to claim that the path phrases in (14)-(16) serve to further specify the meaning of the change of state verbs.

3.1. The Unique Path Constraint and the Anchored Motion

Goldberg (1991) provides an extensive study of the co-occurrence restriction on a change of state expression and a change of location expression in a single clause and formulates the UPC, as in (1), repeated here as (17):

- (17) **Unique Path Constraint:** if an argument X refers to a physical object, then more than one distinct path cannot be predicated of X within a single clause.

At first sight, the UPC appears to ban any co-occurrence of a change of state expression and a change of location expression in a single clause, as in (18):

- (18) a. * Sam kicked Bill black and blue out of the room.
b. * Sam kicked Bill out of the room black and blue.

(= (13))

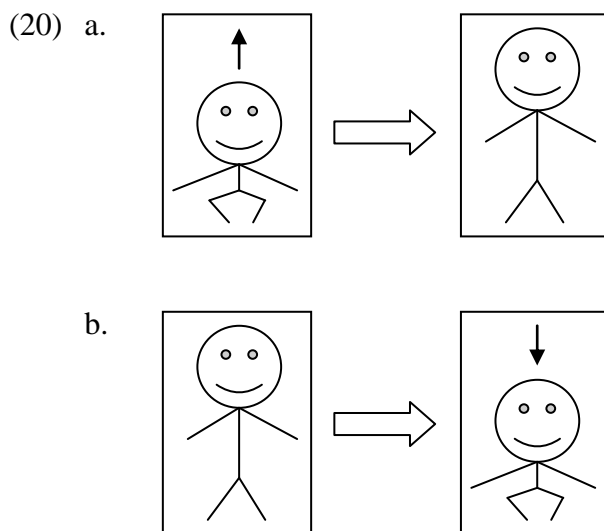
In these sentences, a result phrase and a path phrase are prohibited from co-occurring in a single clause.

The UPC, however, does not always work this way. Witness the following data:

- (19) a. John stood up straight.
b. He got down into a squatting position.

(Goldberg (1991:373), with slight modifications)

In these sentences, the result phrases *straight* and *into a squatting position* co-occur with the path phrases *up* and *down* in a single clause, respectively. Here, the path phrases and the result phrases in these sentences do not refer to two distinct paths. For example, in (19a), the path phrase *up* specifies a motion that accompanies a change of position (becoming straight). The path phrase *up* and the result phrase *straight* refer to the unique path in terms of the change of position. In (19b), likewise, the change of position denoted by the result phrase *into a squatting position* is accompanied by the motion of a part of the body, which is referred to by the path phrase *down*. Thus, the examples in (19) include a unique path in terms of change of position and, therefore, do not violate the UPC. The situations described in (19a) and (19b) can be illustrated by the figures in (20a) and (20b), respectively:



The rightward arrows show transitions of situations, where a situation in the left square changes into one in the right square. The left square of (20a) illustrates that John in (19a) is trying to stand up. As a result, he is standing straight in the right square of (20a). In (20b), similarly, the left square shows that the referent of *he* in (19b) is trying to get down, and

consequently he is in a squatting position, as depicted in the right square. The upward and downward arrows in these figures represent directions of movements. Note that in both cases in (19a) and (19b), the legs are anchored at a fixed location (say, the ground), and what moves is only the upper half of the body. In this way, the change of physical position involves the motion of only a part of an object.

A crucial difference between the sentences in (18) and (19) is whether a path phrase refers to the motion of only a part of an object. The path phrases in (18) express translational motion (Talmy (2000:25)), a movement that changes the location of an object. In (18), Bill is made to move from the inside of the room to the outside. The path phrase *out of the room* expresses a motion in which Bill changes his location. In (19), in contrast, the movements described by the path phrases *up* and *down* do not change the location of the referents of *John* and *he*. Hereafter, let us call this type of motion anchored motion. Anchored motion is defined as follows:²

- (21) Anchored motion is the movement in which an object undergoing change remains anchored at a fixed location, while rearranging parts of its extension in space.

Given the contrast in acceptability between (18) and (19), we can argue that a path phrase can co-occur with a change of state expression in a single clause when the path phrase refers to anchored motion; in this case, no UPC violation arises.

Similar observations are made in Lindner (1982, 1983). Lindner observes that verbs displaying spatial extension (i.e., a process in which an area covered by an object or a group

² This definition is based on Goldberg's (1991:373) statement:

- (i) [T]he object undergoing the change remains anchored at a fixed location, while rearranging parts of its extension in space.

This statement is a part of the explanation of the sentences in (19).

of objects increases) such as *spread* and *lengthen* involve paths that are inherent in the spatial extension, and these paths can be referred to by *out*:

- (22) a. Stretch out the rope.
b. Lengthen out your stride.

(Lindner (1983:94))

In these sentences, the processes of stretching a rope and lengthening one's stride include motion that accompanies spatial extension, and the motion can be expressed by *out*.

Spatial reduction (i.e., a process in which an area covered by an object or a group of objects decreases) also involves motion, and the motion can be referred to by *down* (Lindner (1982:321)):

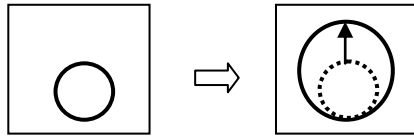
- (23) She {scrunched / crunched} down in the corner so no one would see her.

The action of scrunching or crunching involves spatial reduction, where the height of space occupied by the referent is denoted by the subject *she* decreases. The particle *down* denotes motion that accompanies this spatial reduction. In both of the cases in (22) and (23), the particles *out* and *down* refer to anchored motion but not to a translational motion of objects undergoing a change of spatial extent (i.e., spatial reduction and extension).

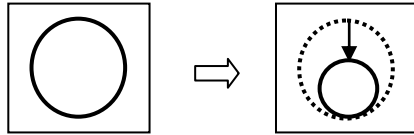
To summarize the analyses of Goldberg (1991) and Lindner (1982, 1983), a change of physical position and spatial extent inherently includes anchored motion, which can be referred to by path phrases. Spatial extension and reduction can be schematically represented by the following figures:³

³ As shown in the figures in (24), there are two types of change of spatial extent: spatial extension and spatial

(24) a. Spatial extension



b. Spatial reduction



The upward and downward arrows in the squares represent motion that accompanies the change of spatial extent, and the rightward arrows show the transitions of situations. The figures in (24a) illustrate spatial extension, corresponding to the examples in (19a) and (22); an action of standing up and spatial extension involve motion from inward to outward. The figures in (24b), in contrast, show spatial reduction, which corresponds to the sentences in (19b) and (23); an action of sitting down inherently includes motion from outward to inward.

In the sentences in (19), (22) and (23), expressions of a change of physical position and spatial extent are allowed to co-occur with path phrases. At first glance, it appears that the change of physical position and spatial extent exhibits a distinct path, and anchored motion described by the path phrases represents another distinct path. The two paths, however, constitute a single unified path because the change of physical position and spatial extent inherently involves the anchored motion; the path phrases further specify the change of physical position and spatial extent.

In summary, the UPC is a constraint that bans a single clause from displaying more than one distinct path. When a change of state expression and a change of location expression co-occur in a single clause, one has to further specify the other; otherwise, each would represent a distinct path, violating the UPC. Anchored motion can further specify spatial

reduction. Detailed analyses of spatial reduction are presented in chapter 4.

extension. For this reason, no UPC violation arises when a sentence includes an expression that denotes spatial extension and a path phrase that describes anchored motion.⁴

3.2. The Under-specification of Shape and the Loss of Physical Integrity

In this subsection, I argue that anchored motion can be involved not only in the change of physical position and spatial extent but also in the change of state in terms of physical separation (i.e., a process in which an entity divides into different parts). Verbs that denote a change of physical position or spatial extent (such as *spread*) and those that denote physical separation (such as *shatter*) share the same semantic property. Both types of verbs are concerned with the meaning of physical shape or configuration. Furthermore, the exact shape or configuration is underspecified, and it can be specified by additional elements.⁵ Thus, the sentence in (25a) can be uttered in any context where the area occupied by the fire is now larger than before. Similarly, the sentence in (25b) is acceptable when the vase broke into pieces, regardless of whether its pieces are apart.

- (25) a. The fire spread quickly.
b. John shattered the vase with a hammer.

⁴ Generally, multiple modifiers that further specify the time or place may co-occur in a single clause:

- (i) a. John arrived [in 2001] [in March] [during the third week] [in the afternoon] [at 2:00 pm].
b. The train arrived [in NYC] [at Penn Station] [on track 31].

The modifiers in brackets specify the time of John's arrival in (ia) and the place where the train arrived in (ib). This also holds true of modifiers that display a change of state or location in terms of spatial extension:

- (ii) Pity him, be reverent to the clay that can no more resist your touch, cover him deep from all your senses, and stand up straight into the sun again with your head beyond the high clouds.
(*The English Review Vol. 33*, underlines mine)

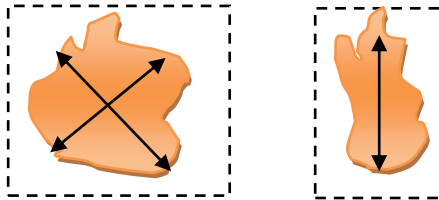
The underlined part in this example includes two path phrases *up* and *into the sun* and the result phrase *straight*. The result phrase refers to the change of position, and the two path phrases specify the direction of standing. All these modifiers further specify the meaning of the verb *stand*.

⁵ In the following sentence, spatial extension codified by the verb *spread* is further specified by the expression *in a conical shape*.

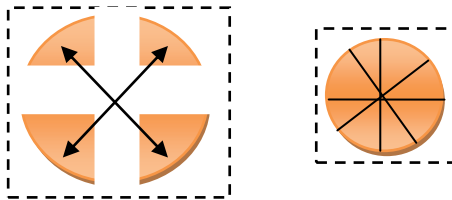
- (i) Thus such jets spread out in a conical shape. (BNC, underlines are mine)

The situations that can be described by these sentences are schematically exemplified below.

(26) a. The fire spread quickly.



b. John shattered the vase with a hammer.



In the figures, the squares composed of broken lines express the configurations of space occupied by the fire or (pieces of) the vase. Arrows represent directions (i.e., anchored motion) of the fire spreading and the physical separation of the vase. In the left figure of (26b), for example, the center of the figure constitutes an area that is anchored, and the extension represented by the arrows involves anchored motion. In this way, anchored motion does not necessarily include a part that is physically anchored at the original position.

Sentence (25a) may describe the situation in the left square of (26a), where the fire spread in all directions, as well as the situation depicted in the right square of (26a), where it spread vertically. Likewise, sentence (25b) may express the situation of the left square in (26b), where the vase broke into pieces and the pieces spread in all directions and that of the right square in (26b), where the vase broke into pieces although the pieces remain together.

Note that the size or configuration of the area occupied by the fire or (pieces of) the vase varies with the way the fire spread or the vase broke, respectively. How the fire spread or the vase broke is the underspecified part of meaning codified by the verb *spread* or *shatter*.

This underspecified part of meaning can be further specified by expressions that are concerned with the change of spatial extent, such as *out* and *all over the floor*, as I will show in the following subsections. Crucially, the further specification using these expressions is possible because these verbs evoke the size or configuration of an object that is under-specified. For example, the size (or shape) of the fire that is spreading is *not* fixed and can be of various sizes depending on the context. Likewise, the configuration occupied by the vase that broke is not fixed, and the pieces may define various configurations depending on the context.

The under-specification of the size or configuration of an object follows from the loss of physical integrity of the object. The loss of physical integrity is the state in which the size or configuration defined by an object is not fixed due to the physical property of the object. An object that has lost physical integrity has the potential for a change in size or configuration. A shattered vase could keep its shape by chance, as shown in the right square in (26b), or it could lose shape and come apart, as shown in the left square in (26b). The same is true of fire. Fire that is spreading has the potential for a change in size because it does not have a fixed shape.

In contrast, verbs that do not express the loss of physical integrity, such as *bend*, do not have the potential for a change in spatial extent, and therefore, they are incompatible with expressions that are relevant to spatial extension.

To summarize this subsection, physical integrity is the key property that determines the compatibility of verbs with expressions that are concerned with spatial extension. Verbs that denote the loss of the physical integrity of an object have the potential for entailing anchored motion. Such verbs are exemplified by those denoting spatial extension (such as *spread*) and physical separation (such as *shatter*). Thus, verbs of spatial extension and those of physical separation are parallel in that they share the loss of physical integrity. The parallelism between

the verbs of spatial extension and those of physical separation will be confirmed by two pieces of evidence, which are shown in sections 3.2.1 and 3.2.2.

3.2.1. Compatibility with a Result Phrase Denoting Spatial Extension

First, my proposal that change of state verbs such as *break* and *shatter* and verbs such as *spread*, which we will call spatial extension verbs hereafter, may share spatial extension meaning can be supported by the consistency of these verbs with the result phrase *apart*.

(27) a. Trent leaped to the portside bilge pump, desperate to clear the remaining water from the hull before its weight *broke the vessel apart*.

b. Another board *shattered apart* and fell inwards in shards.

(BNC, italics are mine)

The result phrase *apart* refers to a state of being separated by a distance. It has been observed that change of state verbs such as *break* and *shatter* can appear with result phrases that further specify the meaning entailed by the verbs (Levin and Rappaport (1995), Washio (1997), Tortora (1998), among others); the fact that these verbs are consistent with *apart* suggests that the meaning of physical separation is entailed by the verbs.^{6,7} The change of state verb *bend*,

⁶ Tortora (1998) argues that the verb *break* can co-occur with result phrases that further specify the meaning of the verb. Observe the following data:

- (i) a. John broke the vase into pieces.
b. * Bill broke the vase worthless. (Jackendoff (1990:240))

The meaning of the verb *break* inherently includes physical separation but not a change in value; the former is exhibited by the result phrase *into pieces* and the latter by the result phrase *worthless*. The verb *break* entails physical separation of an object, and the result phrase *into pieces* further specifies this meaning. The incompatibility of the verb *break* with *worthless* can be explained by saying that the former does not entail the meaning of the latter; the former cannot be further specified by the latter.

⁷ Note that the meaning of the verb *break* varies with the type of NPs co-occurring with it:

- (i) The plate broke.
(ii) She broke a leg in a skiing accident.

by contrast, does not include the meaning of the physical separation of an object, and *apart* is infelicitous as a result phrase:

(28) * John bent the branch apart.

(In the interpretation where “John caused the branch to bend, as a result of this, it broke apart.”)

In this way, change of state verbs that can co-occur with *apart* are restricted to those that entail physical separation.

Spatial extension verbs are also compatible with the result phrase *apart*:

(29) a. He spread his arms apart in a welcoming gesture,...

(G. Lamberson, *Personal Demons*)

b. He stretched his arms apart to emphasize his point. (J. Cotton, *Image of the Beast*)

The verbs *spread* and *stretch* in these sentences denote spatial extension. In sentences (29a) and (29b), the referents of *his arms* move away from each other. The state of *his arms* being away from each other is further specified by the result phrase *apart*.

In this way, change of state verbs such as *break* and spatial extension verbs such as *spread* may co-occur with the result phrase *apart*, which further specifies the spatial extension

(iii) When the clutch broke, the car was locked into second gear.

(COBUILD)

Sentence (i) describes a situation in which a plate shattered into pieces, similar to the example in (25). Here, the verb *break* exhibits the physical separation of an object. The verb *break* in (ii) and (iii), in contrast, does not display this meaning; sentence (ii) expresses the situation in which the referent of the subject *she* injured her leg, and sentence (iii) expresses the situation in which the clutch stopped working.

The conceptualization of the meaning of *break* shown in (26) is not applicable to the sentences in (ii) and (iii), suggesting that the scheme in (26) might be inappropriate for representing the meaning of the verb *break*. I leave this matter for future research.

meaning of the verbs.⁸

In the following subsection, we observe the second piece of evidence for the parallelism in terms of spatial extension between these two types of verbs.

3.2.2. Compatibility with Spatial Extension Expressions

Expressions with *out* or *all over* (e.g., *all over the floor*), which we call spatial extension expressions hereafter, go along with verbs that display spatial extension, as shown below:

- (30) a. Spread out the newspaper to read.
b. He stretched out on the couch. (Lindner (1983:99))
- (31) a. Once the lampshade fell from the ceiling and the glass broke and spread all over the floor. (G. Lunsford, *Georgia Is on My Mind*)
b. We put new carpet in our family room about ten years ago and it has stretched all over the place. (R. Rouse, *Life Is...*)

In sentences (30) and (31), the spatial extension expressions refer to spatial extension exhibited by the verbs *spread* and *stretch*. In (30), for example, *out* specifies a change of location that is involved in the spatial extension of the referents denoted by *the newspaper* and *he*. In (31), likewise, the motion that accompanies the spatial extension of the referents of

⁸ Change of state verbs such as *break* and change of spatial extent verbs such as *spread* are also compatible with result phrases such as *into pieces*, which specify the state of being separated in space:

- (i) Maggie {broke / split / cracked / splintered / crumbled / divided / shattered} the bowl into a thousand pieces. (Jackendoff (1990:117))
(ii) a. The jute is spread in pieces,... (P. Sharp, *Flax, Tow, and Jute Spinning*)
b. The battleship became enlarged, spreading into pieces then exploded from the inside out. (L. Cabral, *Oisin*)

Result phrases such as *into pieces* denote a state of being spatially separated, and the sentences in (i) explicitly show that verbs such as *break* entail physical separation. The physical separation denoted by result phrases such as *into pieces* is also consistent with change of spatial extent verbs, as shown in (ii). The fact that change of state verbs in terms of separation and those of spatial extension are both compatible with result phrases such as *into pieces* supports my proposal that these two types of verbs may share spatial extension meaning.

the glass and *new carpet* is referred to by the spatial expressions *all over the floor* and *all over the place*, respectively. In this way, verbs that express spatial extension are compatible with spatial extension expressions that show the change of location inherent in the spatial extension.

In the same way as the result phrase *apart*, which we have discussed in section 3.2.1, these spatial extension expressions cannot appear with the verb *bend*, which does not include the meaning of spatial extension:

(32) a. * John bent the branch *out* on the floor.

(in the interpretation where “John broke the branch into pieces by bending it, as a result of this, the pieces spread out on the floor.”)

b. * John bent the branch *all over the floor*.

(in the interpretation where “John broke the branch into pieces by bending it, as a result of this, the pieces spread all over the floor.”)

On the basis of the contrast in acceptability between (30)-(31) and (32), let us assume that change of state verbs that are compatible with spatial extension expressions are restricted to those that entail spatial extension.⁹ If this assumption is correct, the following data verify that verbs of physical separation also include the meaning of spatial extension.

(33) a. The side mirror was crushed off and the driver’s window broke out.

⁹ Note that the verb *bend* is compatible with the particle *out* in the following example:

- (i) Turning the stick up and holding the ends in each hand, he bent the stick out and walked across the spot Randy had indicated. (Wesley Arlin Brown, *Coker*)

The verb *bend* specifies the shape of an object, and in this case, this semantic characteristic seems to allow it to co-occur with the particle *out*, which specifies the shape of the object.

(D. Meyer, *Life Is a Road, Ride It Hard!*)

b. They think the windows shattered out because... (R. Cragin, *Wicked Winds*)

(34) a. ... you might have seen an object break into pieces all over the floor, then slowly
vanish. (D. Franson, *2D Artwork and 3D Modeling for Game Artists*)

b. The china shattered all over the deck. (D. Hinton, *Letters from the Dead*)

The verbs *break* and *shatter* in these sentences express the physical separation of an entity into more than one piece, and the spatial extension expressions display spatial extension. In the sentences in (33), the spatial extension expression *out* modifies the change of location involved in the spatial extension of the windows in terms of physical separation. Likewise, *all over* in the sentences in (34) exhibits motion that is included in the physical separation denoted by the verbs.

In this way, verbs of physical separation (e.g., *break*) and those of spatial extension (e.g., *spread*) can co-occur with spatial extension expressions that may refer to spatial extension (e.g., *out* and *all over*).

To sum up this section, verbs of physical separation and those of spatial extension are both compatible with result phrases and spatial extension expressions that can refer to spatial extension.¹⁰ This parallelism between these two types of verbs strongly suggests that verbs of

¹⁰ The parallelism between verbs of physical separation and those of spatial extension can also be verified by their compatibility with subjective motion expressions. Subjective motion expressions denote the spatial range of an entity such as a road, and they can be considered related to spatial extent (cf. Jackendoff (1990)). For this reason, this type of expression is compatible with change of spatial extent verbs, as shown below:

- (i) a. The road extends from San Francisco to Los Angeles. (Matsumoto (1996a:141))
- b. The road widens at the junction. (Matsumoto (1996b:185))
- c. Down below, beyond wisps of vapor steaming past, ocean spreads out to the horizon.
(W. Campbell, *Apotheosis*)

Sentence (ia), for example, expresses that the road ranges from San Francisco to Los Angeles.

Some verbs of physical separation are also compatible with subjective motion expressions. The following sentences include the change of state verbs *split* and *break*:

- (ii) a. Go right onto North Bloomfield Road and follow it up to the top of the hill where the road splits.

physical separation may include the meaning of spatial extension. In section 3.1, we observed that verbs of spatial extension are compatible with path phrases because they inherently include motion, which is called anchored motion. Then, we can predict that verbs of physical separation may involve anchored motion, and they are compatible with path phrases when the path phrases refer to the anchored motion. In the next section, we argue that this prediction is correct.

4. Separation as Spatial Extension

As we have observed in section 1, many researchers have supposed that the sentences in (14)-(16) are counterexamples to the UPC because they include two distinct changes in a single clause:

- (35) a. The butcher sliced the salami onto the wax paper.
 b. Joey grated the cheese onto a serving plate.
 c. Sam shredded the papers into the garbage pail.
- (= (14))

- (36) a. The cook cracked the eggs into the glass.
 b. Daphne shelled the peas onto the plate.
- (= (15))

-
- (L. Austin, *Mountain Bike! Northern California*)
- b. From Copper Basin, several other roads break out to the south, east, and north.
(T. Lopez, *Idaho, a Climbing Guide*)

Sentence (iia) indicates that the road branches at the top of the hill. Sentence (iib), likewise, expresses that several roads run in several directions from Copper Basin.

In this way, both verbs of physical separation and verbs of spatial extension are compatible with subjective motion expressions. The data in (i) and (ii) further support the parallelism between the two types of verbs in terms of spatial extension.

However, note that the verb *bend* also allows the subjective motion use, as shown below:

- (iii) The road bends at the bottom of the hill. (Alison Gangel, *The Sun Hasn't Fallen from the Sky*)

It seems that the subjective motion use is allowed when a given verb expresses a change of physical shape.

(37) Kelly broke the branch off the tree. (= (16))

At first sight, these sentences are structurally similar to the following in that they include a path phrase exhibiting motion of an object:

(38) John threw the ball into the room.

A close scrutiny of these two types of sentences, however, reveals that the sentences in (35)-(37) are crucially different from (38) in the nature of motion. Sentence (38) displays translational motion, which can be confirmed by the unacceptability of the following sentence:

(39) # John has thrown the ball into the room, but he still holds the ball in his hand now.

This sentence suggests that the ball moves into the room, so it cannot stay in John's hand after he threw it.

What is relevant in the sentences in (35)-(37), on the other hand, is anchored motion, where only a part of an object moves along a path.

It is easier to demonstrate this point with the sentences in (36) and (37). In (36), for example, only the content of eggs or peas moves along a path denoted by the path phrases; their shell parts remain anchored at a fixed location, say, in one's hand. In fact, the following sentence cannot describe the situation where "John broke the egg, and then, both the liquid and shell fell into the bowl":

(40) # John broke the egg into the bowl.

In sentence (37), likewise, what moves from the tree is only the branch; and the tree remains anchored at a fixed location, say, at the ground. Thus, the sentences in (36) and (37) involve anchored motion, and hence they satisfy the UPC.

This observation also holds true for the sentences in (35), as illustrated by the following sentences:

- (41) a. Grate or cut the cheese into the sauce, reserving a little to grate over the top of the dish. (A. Sammy, *Aunt Sammy's Radio Recipes, the Underline is Mine*)
- b. John has sliced the carrot into the bowl, but he kept the half of it for tomorrow, so he didn't slice the half part.

The underlined parts in the sentences, in which the interpretation where the whole part of the cheese or the carrot move along a path is cancelled, do not contradict the former part of the sentences.¹¹ This fact explicitly shows that the sentences in (35) entail the motion of only part of an object; the whole object does not have to move along a path. The rest of the object can be considered anchored at a fixed location. The path phrases in (35), therefore, refer to anchored motion, and these sentences are in conformity with the UPC.

When path phrases in sentences such as (41) refer to translational motion, these sentences become unacceptable, as illustrated by the following examples:

¹¹ Similar observations are made by Rappaport and Levin (2001) and Pi (1999). Regarding sentence (i), Pi (1999:191), for example, gives the following remarks in (ii):

- (i) Greg cut the carrot into the bowl.
(ii) Note as well that the process may be one stretch of the cutting action, but the individual pieces fall independently and successively *into the bowl*. Thus, each instance of a piece falling into the bowl might be considered to be a minimal part to the process of *to cut a carrot into the bowl*.

In the quotation in (ii), Pi observes that the event of cutting the carrot into the bowl includes several actions of cutting it. The pieces of it made by each cutting action fall into the bowl successively. Because the path phrase *into the bowl* in (i) refers to the motion of a part of the carrot, the motion can be considered anchored motion.

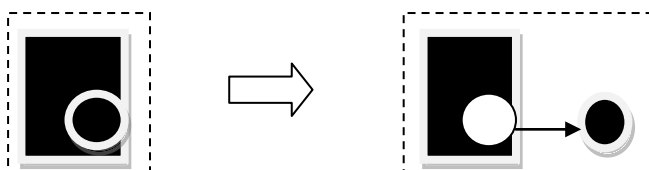
- (42) Mary cut the sausage into the pan.
- a. (Acceptable in the interpretation where “Mary put a sausage into the pan while cutting it little by little.”)
 - b. (Unacceptable in the interpretation where “Mary put cuts in a sausage (but the sausage is not cut into pieces) and put it in the pan.”)

The sentence in (42) is acceptable in the interpretation shown in (42a), but not in the interpretation in (42b). The interpretation in (42a), in which only part of a sausage goes into the pan while Mary cuts the sausage, explicitly includes the anchored motion of the sausage. In contrast, the interpretation in (42b), in which the whole part of a sausage goes into the pan, involves the translational motion of the sausage. The unacceptability of sentence (42) in the interpretation of (42b) can be attributed to the translational motion of the sausage.

In this section, we have observed that the sentences in (35)-(37) include anchored motion, but not translational motion. This means that the path phrases in these sentences further specify the change of state denoted by the verbs. That is, the path phrases refer to motion inherent in the processes of spatial extension in terms of physical separation. As a result, these sentences include only one path, and no UPC violation arises.

The spatial extension expressed by the sentences in (35)-(37) can be represented in the following figures:

- (43) Spatial extension involving physical separation



In these figures, the thick white arrow displays a transition of situations. The thin arrow

represents anchored motion of the circle. In the left square, the black square and the circle constitute a unit. The right square exhibits spatial separation of the circle from the black square. The dotted squares denote the ranges of space covered by the black square and the circle. The figures in (43) show that the black square and the circle in the separated state occupy a larger area than in the unified state.

5. Further Considerations

5.1. *Melt, Empty and Burn*

In the previous section, we observed that the sentences in (35)-(37), which are apparently problematic for the UPC, are not true counterexamples to it. The acceptability of these sentences can be explained by saying that the path phrases in these sentences refer to anchored motion.

Verbs that are compatible with path phrases, however, are not restricted to those that denote physical separation.¹² In fact, it has been noted that verbs that denote a change of state in terms of melting, emptying and burning also go along with path phrases:

(44) The chocolate melted out of the box. (Jackendoff (1990:241))

(45) John emptied the bottle into the sink.

(46) A forest fire broke out in the mountain, and the fire has burned to the city.

¹² The verb *evaporate*, which denotes a change of state, is also compatible with path phrases that specify the motion accompanied by the change of state.

- (i) Rain, snow and hail (collectively known as precipitation) fall on the Earth's surface. A proportion is intercepted by the leaves and stems of plants, and some is evaporated back into the atmosphere. (BNC)
- (ii) Liquids poured into the area evaporate into nothingness. (BNC)
- (iii) These substances, known as volatile organic compounds, evaporate into the atmosphere as the paint dries. (BNC)

Because the change of state in terms of evaporation involves the spatial extension of some liquid in the air, verbs that refer to such change are compatible with path phrases that further specify the spatial extension.

In these sentences, the change of state verbs *melt* and *empty* co-occur with a path phrase, and they appear to violate the UPC.

A close investigation of these examples, however, unveils that the path phrases in these sentences refer to anchored motion, and hence they do not violate the UPC. Let us first consider the sentence in (44). As shown in the following sentence, the verb *melt* is compatible with the result phrase *apart* and with the spatial extension expressions *out* and *all over the grate*, all of which display spatial extension:

(47) John melted the handle and the cup *apart*.

(In the interpretation where “John caused the handle and the cup (which are made of ice) to become apart by melting it.”)

(48) John melted the ice *out* on the floor.

(In the interpretation where “John melted the ice, and then the water spread out on the floor.”)

(49) In just minute the plastic was melted *all over the grate*.

(J. Holmes, *There Should Have Benn Roses*, the italics are mine)

Given the consistency of the verb *melt* with *apart*, *out* and *all over the grate*, we can predict that the sentence in (44) includes anchored motion. This prediction is borne out by the following sentence, which shows that sentence (44) does not entail translational motion of the chocolate:

(50) The chocolate has melted out of the box, but there is still some chocolate in it now.

The underlined part in sentence (50) does not contradict the former part of the sentence. This fact explicitly shows that the motion included in (44) is not translational motion but anchored motion.

Note that the verb *freeze*, which is opposite in meaning to the verb *melt*, cannot co-occur with the path phrase *out of the bottle* in the following sentence:

- (51) * The water froze out of the bottle. (in the sense “The water got out of the bottle by freezing”) (Jackendoff (1990:241))

The unacceptability of this sentence follows because the verb *freeze* does not entail the loss of physical integrity and cannot describe spatial extension, which inherently involves anchored motion. As a result, the path phrase cannot further specify the meaning of the verb, and the unacceptability of (51) results.¹³

The sentence in (45) also involves anchored motion.

- (52) John emptied the bottle into the sink.
- a. (Acceptable in the interpretation where “John poured only liquid into the sink, and the bottle remained in his hand.”)
 - b. (Unacceptable in the interpretation where “John poured liquid into the sink, and then put the empty bottle there.”)

¹³ Note that in the following example, the verb *freeze* co-occurs with *out of the tap*, in contrast with the case in (51).

- (i) Luckily I had left the galley mixer tap open so I imagine that the water froze out of the tap.
(<http://www.ybw.com/forums/archive/index.php/t-257583.html>)

We could explain this example if we argued that some speakers allow the interpretation of spatial extension with the verb *freeze*. In fact, the volume of a liquid increases when it is frozen, and the increase in the volume of a liquid can be accompanied by spatial extension. I will leave further investigation of this matter for future research.

Emptying a bottle of water entails motion of the water out of the bottle, and the sentence in (45) necessarily involves physical separation of the water from the bottle. In fact, sentence (45) is acceptable in the interpretation where the bottle, which undergoes a change of state in terms of emptying, remains in John's hand, as illustrated in (52a). If both the liquid and the bottle went into the sink, as in (52b), this sentence becomes unacceptable because the path phrase in this interpretation refers to translational motion. The contrast in acceptability in (52) explicitly shows that the path phrase in (45) refers to anchored motion.¹⁴

Finally, let us turn to the example in (46). In this case, too, it is predicted that the path phrase *to the city* describes anchored motion of the fire. In fact, the underlined part in the following sentence does not contradict the former part of the sentence.

- (53) A forest fire broke out in the mountain, and the fire has burned to the city, so the fire ranges from the mountain to the city.

The underlined part suggests that the motion described by the path phrase is anchored motion.¹⁵ If the path phrase that co-occurs with the verb *burn* denotes translational motion, the sentence including them becomes infelicitous, as exemplified below:

- (54) * The rocket burned into the hotel. (in the sense “The rocket got into the hotel by burning”) (Jackendoff (1990:241))

The infelicity follows because the motion described by this sentence is translational motion.

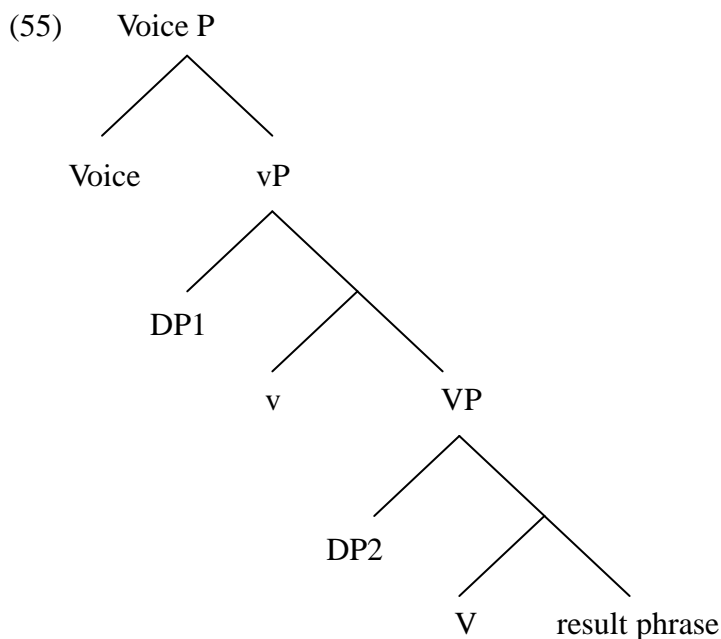
¹⁴ The verb *empty* seems to be incompatible with expressions such as *apart*, *out* and *all over the floor*, which I use as diagnostics for identifying the spatial extension meaning of verbs. I would like to leave this matter for future research.

¹⁵ Even if the area in which the fire originated became the remains of a fire, this can be considered an anchored part of the change of state.

The contrast between (53) and (54) clearly shows that the compatibility of the verb *burn* with a path phrase in a single clause crucially depends on whether the motion described by the sentence is anchored motion.¹⁶

5.2. The Syntax of Path Phrases

Thus far, we have seen that apparent counterexamples to the UPC include path phrases that further specify the meaning of the verbs. In this respect, the path phrases are similar to result phrases. Result phrases are also considered to specify the change of state encoded in the verbs (see Washio (1997) and Tortora (1998), among many others). In this thesis, I assume that result phrases are adjoined to the XP3 position, as shown by the following tree structure:



¹⁶ The verb *burn* can co-occur with *all over the earth*, as shown in (i):

- (i) And when he shot, fire sprang up and burned all over the earth.
(Robert Brightman, *Traditional Narratives of the Rock Cree Indians*)

This verb, however, seems to be incompatible with other expressions such as *apart* and *out* similar to the verb *empty*. I will also leave this issue for future research.

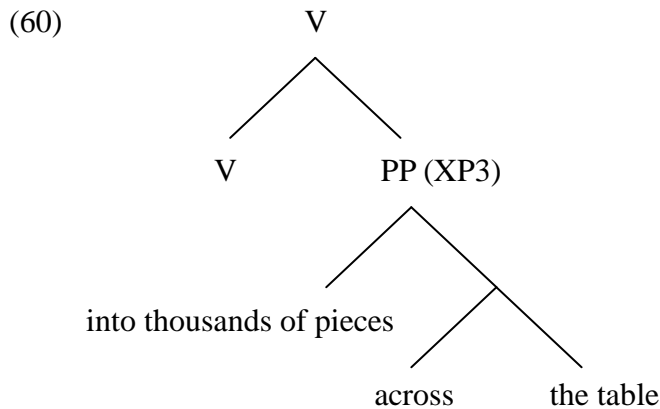
Likewise, the path phrases that co-occur with the change of state verbs that we have considered in this chapter are associated with the XP3 position. In fact, the result phrases and path phrases cannot be stranded by the pro-form *did* in pseudo-cleft sentences:

- (56) a. He broke the vase into pieces.
b. * What he did into pieces was break the vase.
- (57) a. John broke the egg into the bowl.
b. * What John did into the bowl was break the egg.
- (58) a. John sliced the carrot into the bowl.
b. * What John did into the bowl was slice the carrot.

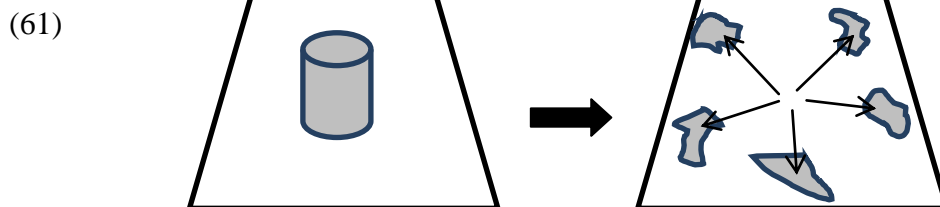
The data indicate that the result phrase *into pieces* and the path phrase *into the bowl* are both adjoined to VP.

Note that it is possible to combine multiple XPs in a single clause as long as a further specification relation exists between them, as in (59). In this case, multiple XP3s form a single complex XP3, as in (60) (cf. Jackendoff (1973), Kim (2001) and Maruta and Hirata (2001)):

- (59) John broke the glass into thousands of pieces across the table.



In sentence (59), the result phrase *across the table* further specifies the precedent result phrase *into thousands of pieces*. Here, the two XP3s refer to two sides of the same situation. The event of the glass breaking into thousands of pieces is nearly the same as the event of the glass spreading across the table. For this reason, the path phrase *across the table* serves to further specify the meaning of the result phrase *into thousands of pieces*, and they form a constituent.



My claim that the two PPs in (59) form a constituent, as in (60), can be supported by the following two pieces of evidence. First, the two PPs do not allow the intervention of a manner adverb.

- (62) a. John broke the glass into thousands of pieces across the table quickly.
 b. * John broke the glass into thousands of pieces quickly across the table.

The contrast in acceptability shows that the sequence composed of the two PPs cannot be separated by the manner adverb *quickly*.

Second, the extraction of one PP from the sequence composed of the two PPs is not allowed, as shown below:

(63) * Where did he break the glass into thousands of pieces ____? Across the table.

cf. Where did he break the glass ____? Across the table.

The unacceptability of the sentence in (63) suggests that the extraction of one PP (i.e., *across the table*) out of the sequence of the two PPs is not allowed. The facts we have observed in (62) and (63) are shared by constituents that are composed of more than one PP (cf. Jackendoff (1973)).

In this subsection, I have shown that the XP3 status of the path phrases that co-occur with change of state verbs can also be supported from the syntactic perspectives.

6. Critical Review of Previous Approaches to the UPC Effect

In this section, I critically review three previous approaches to the UPC effect. It is shown that these approaches are inadequate.

6.1. Pragmatic Condition Approach

Goldberg (1995, 2001) argues that change of state verbs are compatible with path phrases when the sentence involves the intentionality of an agent:

(64) Paths of motion may be predicated of arguments of result verbs if the activity designated by the verb is associated with a conventional scenario in which the

incidental motion can be construed as an intended and predictable effect.

(Goldberg (2001:520))

Goldberg formulates this condition to account for the acceptability of the examples in (35), stating that the validity of this condition can be corroborated by the following contrast in acceptability:

- (65) a. The butcher sliced the salami onto the wax paper.
b. Joey grated the cheese onto a serving plate.
c. Sam shredded the papers into the garbage pail.

(= (35))

- (66) a. * Sam unintentionally broke the eggs onto the floor.
b. Sam carefully broke the eggs into the bowl.

(Goldberg (1995:171))

Sentence (66a) shows that the adverb *unintentionally* is not consistent with sentences like (65). The adverb *unintentionally* in sentence (66a) denotes that the agent has no intention to cause the eggs to fall onto the floor. According to Goldberg, the unacceptability of (66a) follows from the violation of condition (64); the agent lacks the intention to cause the motion of the eggs. Sentence (66b), on the other hand, is well formed because the adverb *carefully* guarantees the intention of the agent to cause the motion, satisfying the condition in (64).

The occurrence of adverbs that express un-intentionality, however, does not necessarily degrade these sentences.

- (67) Sam accidentally broke the eggs onto the floor. (Matsumoto (2002:196))

- (68) a. Sam {carelessly / accidentally} broke the eggs into the bowl.
 b. The machine sliced the salami onto the wax paper.

(Okuno (2003:169))

The adverbs *accidentally* and *carelessly* denote the unintentionality of an agent, and the sentences in (67) and (68a) violate condition (64). Likewise, the machine in (68b) is an inanimate entity, so intentionality is irrelevant here, and the condition not satisfied. Despite these facts, the sentences are acceptable.

Although the intentionality of an agent seems to be relevant to the acceptability of sentences like (66), the sentences in (67) and (68) explicitly suggest that the intentionality of an agent is not crucially relevant to the co-occurrence restriction on a change of state expression and a change of location expression in a single clause.

6.2. Polysemy-based Approach

Levin and Rappaport (1995:60) propose the polysemy-based account of the UPC effect. They argue that the co-occurrence of a change of state verb and a path phrase in a single clause is possible when the referent of NP that undergoes a change of state and a change of location can denote more than one object polysemously. For example, observe the following:

- (69) a. The cook cracked the eggs into the glass. (= (36a))
 b. Daphne shelled the peas onto the plate. (= (36b))
 c. slice the mushrooms into the bowl (Levin and Rappaport (1995:60))

Levin and Rappaport argue that *the eggs*, *the peas*, and *the mushrooms* in these sentences are polysemous. In sentence (69a), for instance, what the cook cracked is the whole eggs, and

what fell into the glass is the liquid part of the eggs. Although both the whole eggs and the liquid part of the eggs are referred to by the name *egg*, the referents are different; the name *egg* is polysemous between the whole egg and the liquid part. Likewise, *the peas* refer to the shell part and the content part in sentence (69b). What participated in the change of state denoted by the verb *shell* is the shell part of the peas, and what moved onto the plate is the content part of the peas. *The mushrooms* in (69c) can also be considered polysemous. *The mushrooms* refer to both the whole mushrooms and the sliced mushrooms. What is sliced is the whole mushrooms, and what participated in the change of location is the sliced part of the mushrooms.

According to Levin and Rappaport (1995), when an NP cannot refer to two entities polysemously, this NP is incompatible with a change of state verb and a path phrase in a single clause, as is exemplified by the following:

- (70) a. * I broke the mirror into the garbage pail. (Levin and Rappaport (1995:61))
b. a mirror \neq pieces of a mirror

In this sentence, although the NP *the mirror* refers to the whole mirror, it cannot refer to pieces of a mirror.

In this way, Levin and Rappaport's (1995) polysemy-based account appears to successfully explain the contrast in acceptability between (69) and (70a). This account, however, immediately faces serious theoretical and empirical problems.

First, the theoretical motivation of the polysemy-based account is unclear. Levin and Rappaport (1995) claim that there exists a restriction that 'only one change per entity may be expressed in a single clause' (Levin and Rappaport (1995:60)). However, they provide no mechanism in which this restriction works. Because there is no theoretical motivation for the

restriction, it is nothing but a generalization.

Furthermore, this generalization proves to be inadequate empirically. Although the following sentence includes the NP *the mirror*, in the same way as (61a), it is compatible with the change of state verb *break* and the path phrase *into the trash can* in a single clause:

(71) John broke the mirror into the trash can little by little.

Sentence (71) is acceptable in the interpretation in which John divided the mirror little by little while putting each piece into the trash can. In this interpretation, only part of the mirror moves into the trash can at one time. In the hierarchical event structure theory, the acceptability of this sentence naturally follows because the path phrase *into the trash can* evokes anchored motion, which serves to further specify the meaning of the verb *break*.

6.3. The Single Development Constraint Account

To account for the co-occurrence restriction on a change of state expression and a change of location expression in a single clause, Matsumoto (2006) proposes the Single Development Constraint:

(72) Single Development Constraint: Within a single clause, spatial and nonspatial path phrases describing the location or state of an entity must refer to aspects of a single line of development that the entity follows.

This constraint allows the co-occurrence of a change of state expression and a change of location expression in a single clause when both describe aspects of a single line of change.

For example, observe the following:

(73) Joe flung the door open right into Bob's face. (Matsumoto (2006))

In this sentence, the change of state expression *open* and the change of location expression *right into Bob's face* co-occur in a single clause. According to Matsumoto, the path phrase *right into Bob's face* refers to an aspect of the change denoted by the result phrase *open*, so this sentence is acceptable. The event of the door opening inherently includes a motion of the door, which is referred to by the path phrase.

However, the definition of “a single line of development” in the statement of the constraint is unclear. The lack of clarity of the definition leads to the incorrect prediction that the following sentences are acceptable because the change of state verb and the path phrase in them refer to aspects of a single line of development an entity follows.

(74) * The rocket burned into the hotel. (Jackendoff (1990:241))

(75) a. * Sam tickled Chris silly off her chair.

b. * Sam tickled Chris off her chair silly.

(Goldberg (1991:368))

The scenario in which the rocket burned and, as a result, fell into the hotel seems to follow a single line of development, and it would be predicted that the sentence in (74) is acceptable on the basis of the Single Development Constraint, but in fact this sentence is unacceptable. Likewise, the change of state of being silly and the change of location of Chris seem to refer to a single line of development in (75); that is, it is easy to imagine a situation in which Sam tickled Chris silly and as a result of this, Chris fell from her chair. In this case, it would be predicted that the sentences in (75) are both acceptable under the Single Development Constraint account, but these sentences are unacceptable. Under the account I have developed

in this chapter, the unacceptability of these sentences follows because the path phrases do not refer to anchored motion, so they cannot describe a single unified change, violating the UPC.

6.4. Summary

In this section, I have argued that the three previous approaches to the UPC effect are inadequate on theoretical or empirical grounds. All of the inadequacy of these approaches can be successfully explained by the analysis presented in this chapter.

7. The UPC Effect in Japanese

Although the UPC was originally proposed to explain the co-occurrence restriction in English, several researchers note that the UPC is also applicable to Japanese (Kageyama (1999) and Ho (2010), among others):

- (76) a. * *Tokei-o yuka-ni otosi-kowasu*
 the clock-Acc the floor-Dat drop-break.
 b. * *Koppu-o wari-suteru*
 the cup-Acc break-throw

(Ho (2010:136))

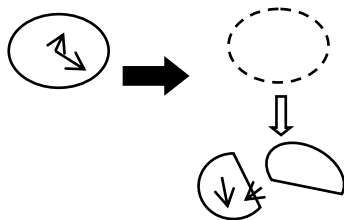


Figure 1 (cf. (67a))

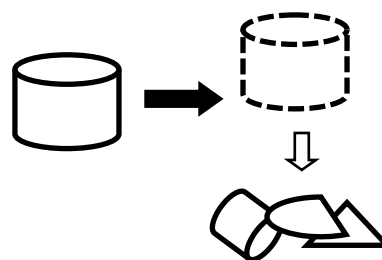


Figure 2 (cf. (67b))

The V-V compounds *otosi-kowasu* (drop-break) and *wari-suteru* (break-throw) in these

sentences are unacceptable because they are composed of a change of state verb and a change of location verb and, hence, violate the UPC. Note that the motion involved in the sentences evokes translational motion, as illustrated in the figures.

If human language is universally devised as sensitive to the mechanism of event structure developed in this thesis, we can predict that the co-occurrence of a change of state expression and a change of location expression is allowed when they are in a further specification relation, in parallel with the cases in English.

(77) I cut down a big tree, and then ... (BNC)

(78) The roof burned off the Catholic church ... (M. R. Doyle, *Events of This Day*)

(79) The rear window shattered into the backseat.

(R. Trebilcock, *The Genesis Signature*)

(80) John broke the egg into the bowl.

In these sentences, the verbs *cut*, *burn*, *shatter* and *break* denote a change of state, and the path phrases *down*, *off the Catholic church*, *into the backseat* and *into the bowl* express a change of location. The co-occurrence of the change of state verbs and the path phrases are possible because the path phrases evoke anchored motion, which serve to further specify the change of state denoted by verbs.

The prediction is justified by the following V-V compounds:

(81) Taro-ga ki-o kiri-taosita.

Taro-Nom the tree-Acc cut-felled

(82) Juutaku-no 2kaibubun-ga yake-otita.

the house-Gen 2nd floor-Nom burn-fall.past

- (83) Madogarasu-ga ware-otita.
 the window-Nom break-fall.past
- (84) Taro-ga tamago-o wari-ireta
 Taro-Nom the egg-Acc break-drop. past

((81) and (82) are cited from Ho (2010:136))

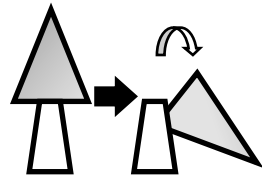


Figure 3 (cf. (81))

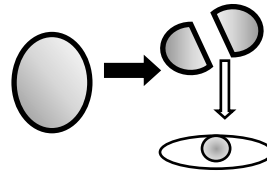


Figure 4 (cf. (84))

All the V-V compounds exemplified here comprise a change of state verb and a change of location verb: *kiri-taosu* (cut-fell), *yake-otiru* (burn-fall), *ware-otiru* (break-fall) and *wari-ireru* (break-drop).

It should be noted here that all the change of location verbs *taosu* ‘fell’, *otiru* ‘fall’ and *ireru* ‘drop’, which are included in the V-V compounds in (81) to (84), refer to anchored motion. As the sentences in (77) to (79) do, the sentences in (81) to (84) depict situations in which only a part of an object moves along a path, with the rest of the object remaining at a fixed location. Although the Japanese grammatical system is different from the English system given that Japanese uses V-V compounds, the parallelism between English ((77)-(79)) and Japanese ((81)-(84)) strongly suggests that the same mechanism underlies and constrains both languages.

8. Conclusion

Under the hierarchical event structure theory, the UPC effect naturally comes from the nature of the hierarchical event structure: more than one distinct change cannot be associated with a

single result event. In this chapter I have argued that the sentences in (35)-(37), which are considered counterexamples to the UPC by many researchers, are only apparent counterexamples. Although these sentences include a change of state verb and a path phrase in a single clause, and it appears that they contain two distinct paths, I have shown that the change of state exhibited by the verb and the motion denoted by the path phrase constitute a single unified path. Specifically, I have shown that the path phrases in these sentences refer to motion inherently involved in the change of state denoted by the verbs. For this reason, no UPC violation arises in the sentences in (35)-(37). The discussion in this chapter is in conformity with the hierarchical event structure theory.

Chapter 4

A Closer Look at the Unique Path Constraint Effect (2): Spatial Reduction

1. Introduction

The Unique Path Constraint (henceforth, the UPC) is a constraint that prohibits the co-occurrence of more than one distinct change-denoting expression in a single clause. The UPC violation does not arise when these expressions are in a further specification relation. The previous chapter has shown that change of state expressions that evoke spatial extension are compatible with change of location expressions that specify the spatial extension. I have called such a change of location the anchored motion. This chapter argues that the anchored motion analysis is applicable to the co-occurrence of a change of location expression and a change of state expression that evoke spatial reduction, the opposite of spatial extension. Consequently, the co-occurrence of a change of state expression and a change of location expression, as exemplified in (1), is possible without violating the UPC.

- (1) a. Amelia rolled up Nina's torn sleeve and tied the tourniquet tight around her upper arm.
- b. Out in the corral, tied so tight to the bid stake in the centre that the Argentines call a palemque that she couldn't even move her head, was the little grey pony.
- c. I should be bound even tighter to my mother.

(Iwata (2006:464))

The organization of this chapter is as follows. Section 2 shows that verbs that typically express spatial reduction are compatible with path phrases that modify the spatial reduction. Section 3 further shows that spatial combination, which involves the physical unification of more than one distinct entity, can also be considered a subtype of spatial reduction. Based on the discussions, section 4 argues that the verbs *tie* and *bind*, which express spatial combination, are compatible with a result phrase and a path phrase when these phrases are in a further specification relation. In this case, no UPC violation arises, and the apparent counterexamples in (1) follow. Section 5 provides additional evidence for my further specification analysis. Section 6 offers concluding remarks.

2. Spatial Reduction Verbs

In chapter 3, we observed that change of state verbs are compatible with path phrases when these phrases denote motion that evokes anchored motion, which serves to modify spatial extension described by change of state expressions. In this section, I argue that verbs that lexically express spatial reduction, such as *shrink*, *dwindle* and *contract*, are also compatible with path phrases that modify their spatial reduction meaning. Hereafter, we refer to these verbs as spatial reduction verbs.

Spatial reduction verbs inherently express spatial reduction, as shown below:

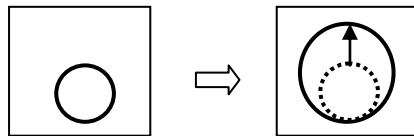
- (2) a. I'm worried about washing that shirt in case it shrinks. (LDOCE)
- b. The trees dwindled in height. (Max Brand, *Rippon Rides Double*)
- c. Metal contracts as it cools. (LDOCE)

The verbs *shrink*, *dwindle* and *contract* in these examples lexically express spatial

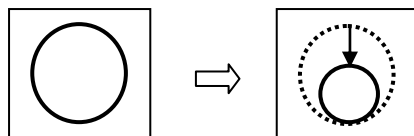
reduction. The phrase *it shrinks* in sentence (2a), for example, means that the shirt becomes small in size. Sentence (2b) indicates that the trees became small in height. In sentence (2c), the metal has the property of becoming small when it is cooled.

In the previous chapter, we observed that spatial reduction is a subtype of a change of spatial extent, whose opposite is spatial extension.

(3) a. Spatial extension



b. Spatial reduction



Although spatial reduction and spatial extension are the opposite of each other from the conceptual viewpoint, they share two significant properties. In the remainder of this section, I show that both properties are related to spatial extent, suggesting that change of spatial extent underlies spatial extension as well as spatial reduction.

First, both spatial reduction and spatial extension verbs are compatible with result phrases that further specify the spatial extent.

(4) a. Then, with a familiar flash of pain, I shrank into a small, furry body.

(Mary Downing Hahn, *Witch Catcher*)

b. Below her shoulders, the unfortunate young woman's body dwindled away to almost nothing, making him wonder how it could possibly contain her vital organs. (John Ballem, *A Victim of Convenience*)

- c. The bladder was contracted into a small mass about three inches in length, and one and a half inches in width, and close against the pubic bone and empty. (James Syme, *Principles and practice of surgery*)
- (5)
- a. He spread the paper open with the tip of his pen and read the note.
(Dan Morris, *Beyond Evil*)
 - b. She crossed to the kitchen table and spread the paper wide, thumbing through until she found the classifieds section.
(Sarah Mayberry, *The Best Laid Plans*)

The result phrases *into a small, furry body*, *to almost nothing* and *into a small mass* in (4) express the state of being small in size, which is attributed to the entities denoted by *I*, *the unfortunate young woman's body* and *the bladder*, respectively. In these examples, the result phrases further specify the meaning of the spatial reduction verbs, in parallel fashion with the examples in (5), where the result phrases *open* and *wide* further specify the spatial extension evoked by the verb *spread*.

Second, spatial reduction and spatial extension verbs are both compatible with subjective motion expressions, which are considered related to spatial extent (Jackendoff (1990)):

- (6)
- a. Soon this rocky road shrinks to a single-track trail and meets the connector from the Kearsarge Pass Trail mentioned above, approximately 350 yards from the parking area.
(Mike White, *Kings Canyon National Park: A Complete Hiker's Guide*)
 - b. The road dwindles to a narrow footpath on a contour.
(James Collins, Jimmy Collins, *Soft blows the wind: on foot to Walsingham*)

- c. After a few hundred feet the path contracts from a gentle stroll to a teetering trek along several miles of a windy knife edge fringed by native trees, one of the best views of Honolulu.

(Paul Theroux, *Fresh air friend*)

- (7) a. The road extends from San Francisco to Los Angeles.
(Matsumoto (1996a:141))
- b. The road widens at the junction. (Matsumoto (1996b:185))
- c. Down below, beyond wisps of vapor steaming past, ocean spreads out to the horizon. (W. Campbell, *Apotheosis*)
- d. On the right the plain of Argos stretched open to the sea, which, although I could not see it, I knew was only a few miles away.

(Leonard Cottrell, *The Bull of Minos*)

In the sentences in (6), for example, the verbs *shrink*, *dwindle*, and *contract* do not express a physical change of spatial reduction of the road or path but the state of the road or path being narrow at the particular places. Likewise, the verbs *extend*, *widen* and *spread* in (7) do not describe a dynamic but a static eventuality.

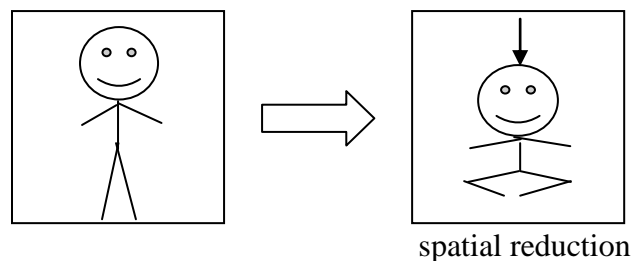
These two parallel properties between spatial extension verbs and spatial reduction verbs suggest that the latter verbs are compatible with path phrases that evoke anchored motion that further specifies the spatial reduction, in a parallel fashion with the cases of the verbs that express spatial extension. The following data confirm this point:

- (8) a. He shrank down, and crept forward,...
- (Samuel Smiles, *Robert Dick, baker of Thurso, geologist and botanist*)

- b. Slowly and surely the flame dwindled inward; the tingle fell away from his arms and legs. (Michelle Sagara West, *Lady of Mercy*)
- c. This cage can be expanded upward and outward, or contracted inward and downward. (Jerome Hines, *The four voices of men*)
- (9) a. The fire spread to the top of the roof and down the other side.
(Bill Malins, *Coming in to Land*, the underline is mine)
- b. Using the hold-relax technique, a limb or muscle stretched to the point where further motion in the desired direction is prevented by the tension in muscle being stretched (antagonistic muscle).
(Michael J. Alter, *Science of Flexibility*, the underline is mine)

The path phrases *down*, *inward* and *inward and downward* in (8) specify the spatial reduction. That is, they express a change of location that is not independent of the spatial reduction. For example, sentence (8a) expresses a situation where he became small while keeping his basic location in the same place. The image of this sentence is illustrated in the following figure:

Figure 1: He shrank down,... (= (8a))



The arrow pointing downward denotes the motion involved in the spatial reduction of *he*. The lower half of his body keeps its same basic location, and what moved down is

only the upper half of his body. Similarly, the sentences in (9) express spatial extension, and the underlined path phrases further specify the spatial extension.

The compatibility of spatial reduction with anchored motion is further confirmed by the co-occurrence of a result phrase that evokes spatial reduction and a path phrase that expresses anchored motion in a single clause, as in (10). Again, result phrases that express spatial extension are also compatible with path phrases that express anchored motion, as in (11).

(10) a. I saw the face of the Virgin, and I shrank down into a tiny child in her arms. (Anne Rice, *Lasher*, the underlined are mine)

b. “It seems as if all at once the world had swelled out in size a thousandfold, and that poor me had dwindled down to the merest wee little red-headed atom-the most helpless and forlorn and lonesome of atoms at that.”

(Steven Carter, *Devotions to the text*, the underlined are mine)

c. Kurt had contracted down into that smallest known, and most painful element in the universe: “Me.”

(Steve Chandler, *Reinventing yourself*, the underlined are mine)

(11) a. But here she was, still in her old flannelette nightie, slumped low on the chair with her arms spread wide to the floor and now forever in that silent plea.

(Christopher Barker, *The Arms of the Infinite*, the underlines are mine)

b. The walls were full of photos in cheap plastic frames: A young boy held a net of frogs, his expression stiff and sorrowful; the same boy stood at the edge of a cliff at sunset with his arms spread open toward

the camera. (Leslie Jamison, *The Gin Closet*, the underlined are mine)

c. He stood on the altar, arms stretched wide to the vaulted ceiling.

(James Alan Gardner, *Gravity Wells*, the underlined are mine)

In sentence (10a), for example, the path phrase *down* specifies the motion that is involved in the spatial reduction of the referent of *I*, and the result phrase *into a tiny child* expresses a situation in which it became small. In sentence (10b), the result phrase *to the merest wee little red-headed atom-the most helpless and forlorn and lonesome of atoms* designates the result state of the referent of *poor me*, and the path phrase *down* denotes the change of location that accompanies the spatial reduction. In sentence (10c), the result state of Kurt is expressed by the result phrase *into that smallest known, and most painful element in the universe*, and the motion that is involved in this spatial reduction is expressed by the path phrase *down*.

Likewise, the sentences in (11) exemplify the co-occurrence of a result phrase that expresses spatial extension and a path phrase that evokes anchored motion. In sentence (11a), the path phrase *to the floor* specifies the motion of her arms that accompanies their spatial extension. The same is true of sentence (11b) and (11c).

In summary, this section has argued that spatial reduction verbs such as *shrink*, *dwindle*, and *contract* lexically express spatial reduction. The spatial reduction is a subtype of change of spatial extent, and the change inherently involves anchored motion. As a result, the spatial reduction verbs allow the occurrence of a path phrase that denotes anchored motion.

3. Spatial Combination

In the previous chapter, we saw that change of state in terms of physical separation can

be considered a subtype of spatial extension. The physical separation is a change of state in which one entity is divided into more than one piece. Given the parallelism between spatial extension and spatial reduction discussed in the previous section, it is natural to assume that the spatial reduction analysis also holds of spatial combination, which is a change of state in which more than one entity can be unified, the opposite of physical separation. Consequently, it is predicted that verbs that express spatial combination are compatible with path phrases that evoke anchored motion. This section empirically confirms this prediction.

Verbs such as *blend* and *mix* express spatial combination in which there is a combination of more than one entity. Hereafter, we refer to these verbs as spatial combination verbs, which are exemplified by the following:

- (12) a. The machine blended the ingredients instantly. (Miller (2002:175))
b. One mixes different kinds of wine. (Saito (1984:1147))

Both the sentences in (12) express a situation in which there is a combination of more than one entity. Sentence (12a), for example, indicates that the ingredients combine into one entity. Sentence (12b) also suggests that more than one type of wine is combined together.

Spatial combination of more than one entity can be regarded as a type of spatial reduction, as illustrated by the following figure:

Figure 2: The machine blended the ingredients instantly. (= (12a))

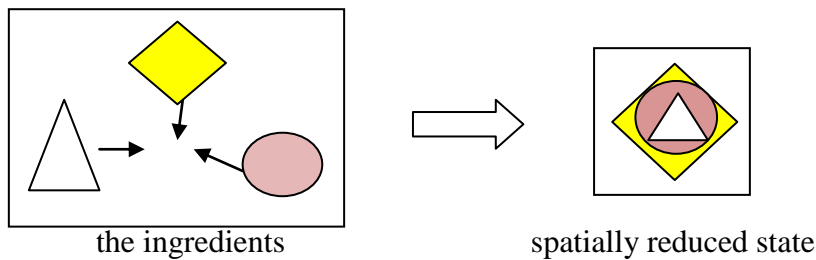


Figure 2 shows an image of the situation described in sentence (12a). The left square includes three ingredients, and the right square expresses their spatially reduced state. Combining more than one entity presupposes that these entities are apart spatially before they are combined together. The original state in which they are separate is illustrated in the left square, and the result state of being combined is shown in the right square. As indicated by the size of the two squares, the configuration defined by the entities that are combined together is spatially smaller than that formed by the entities that are in a separate state. In this way, spatial combination inherently includes spatial reduction.

Spatial combination is a subtype of spatial reduction, so it shares the two essential properties with spatial reduction, namely, the compatibility with result phrases that evoke a change of spatial extent and compatibility with subjective motion expressions, as illustrated by the following data.

- (13) a. Chopped onion, vinegar, bits of bacon, black pepper and sugar were blended together in a chafing dish to make the piquant dressing.
(Oliver David Keep, *Fortnight*)
- b. First mix the butter and sugar together, then add the milk. (*LDOCE*)
- (14) a. At 4.5 miles Lake Avenue blends into Chestnut Street, ...

(Greg Marr, *Short Bike Rides in Wisconsin*)

- b. ... places where rivers mix with the sea ...

(David W. Harp, Tom Horton, *Water's Way: Life Along the Chesapeake*)

The spatial combination verbs are compatible with the result phrase *together*, which further specifies the result state (i.e., the state in which more than one entity is combined), as in (13). In sentence (13a), for example, several flavorings and foods are unified together. In sentence (13b), similarly, the butter and the sugar are combined into one entity. Furthermore, spatial combination verbs can appear in subjective motion expressions, as illustrated in (14). These sentences express a certain arrangement of roads or rivers and the sea, and they are static but not dynamic descriptions.

In this way, spatial combination verbs share the two significant properties with spatial reduction verbs. This parallelism allows the spatial combination verbs to co-occur with path phrases that evoke anchored motion.

- (15) a. Alan poured milk. They watched how it blended into the soup as he stirred, smoothly, effortlessly.

(Georgina Kleege, *Home for the summer*)

- b. Dan mixed the flour into the milk. (Miller (2002:175))

The path phrase *into the soup* in sentence (15a) specifies the motion included in the spatial reduction in terms of blending the milk and the soup. The soup is anchored at the original position, and the milk is poured into it. The motion involved here constitutes anchored motion. Likewise, the path phrase *into the milk* in sentence (15b) expresses a change of location that is part of the process in which the flour is mixed into the milk.

Again, the milk is anchored at the original place and the flour moves into it. The motion included here is anchored motion. Thus, spatial combination verbs are compatible with path phrases that further specify the motion involved in the spatial combination.

In this way, we observe that spatial combination is a subtype of spatial reduction and that the compatibility of spatial combination verbs with a path phrase can be attributed to the spatial reduction lexicalized by the verbs.

My claim that the path phrases in (15) evoke anchored motion leads to two further predictions. Recall that spatial combination is a change in which more than one entity is unified. Their unification presupposes their physical contact. Thus the anchored motion expressed by path phrases that co-occur with spatial combination verbs must entail physical contact. This obligatory physical contact entailment can be confirmed by compatibility with a path phrase headed by *toward*:

- (16) a. John blended the milk into the coffee.
b. * John blended the milk toward the coffee.
- (17) a. John mixed the milk into the coffee.
b. * John mixed the milk toward the coffee.

The sentences in (16b) and (17b) show that the spatial combination verbs *blend* and *mix* are incompatible with path phrases headed by *toward*. The incompatibility of these verbs with *toward* follows because *toward* does not entail physical contact, which is necessary to spatial combination.

Furthermore, it is predicted that the referent of the goal of anchored motion must be an entity with which the subject of motion combines. This prediction is justified by the following data:

- (18) a. John blended the milk and the chocolate into the coffee.
 b. John mixed the milk and the chocolate into the coffee.
- (19) a. * John blended the milk and the coffee into the empty glass.
 b. * John mixed the milk and the coffee into the empty glass.

The sentences in (18) are licit. In this case, the goal of the anchored motion of the milk and the chocolate is the coffee, with which the former two ingredients are combined. The sentences in (19), by contrast, are illicit. The intended meaning of the sentences is that John blended or mixed the milk and the coffee and then he poured it into the empty glass. In this intended meaning, the change of state denoted by the verbs and change of location expressed by the path phrases are independent of each other. In this case, the change of state in terms of combining does not take place at the end of the change of location of the milk and the coffee. Crucially, the unacceptability of these sentences follows because the goal of the anchored motion of the ingredients is not the object with which the ingredients are combined.¹

In this section, we have observed that spatial combination verbs such as *blend* and *mix* express spatial reduction in terms of spatial combination. The spatial reduction lexicalized by the verbs allows path phrases that evoke anchored motion to co-occur with them. It has been shown that the spatial reduction of the spatial combination verbs is further supported by the entailment of physical contact.

¹ When the preposition *into* in (19) is replaced with *in*, the sentences become acceptable.

- (i) a. John blended the milk and the coffee in the empty glass.
 b. John mixed the milk and the coffee in the empty glass.

In this case, however, the PP is interpreted as a location in which the spatial combination occurs, but not the goal of motion.

4. Connection Verbs

In the previous section, I have argued that spatial combination inherently involves anchored motion. This section shows that verbs such as *tie* and *bind*, which we call connection verbs, also express spatial reduction in terms of spatial combination. As a result, these verbs allow the co-occurrence of a result phrase and a path phrase, as in (1).

Spatial reduction in terms of spatial combination denoted by connection verbs can be confirmed by the following two properties: compatibility with result phrases that express spatial reduction and compatibility with subjective motion expressions.

- (20) a. He unloosed his sash, and bound her arms tight,...
- (Elizabeth Gaskell, Morton Hall)
- b. ...whose long hair was bound into a knot at the nape of his neck.
- (Rockwell Kent, *N by E*)
- (21) a. He tied his shoelaces tight. (Washio (1997:17))
- b. He tied the string into a knot.
- (22) a. As the Isthmian Highway binds North and South America together geographically at the Isthmus of Panama,...
- (Hugh Gordon Miller, *The Isthmian highway: a review of the problems of the Caribbean*)
- b. A series of secondary roads tie the major cities and towns to minor towns and villages,...
- (Robert H. Scales, *Certain victory: the U.S Army in the Gulf War*)

The examples in (20) and (21) show the co-occurrence of the connection verbs with result phrases that evoke spatial reduction. In sentences (20a) and (21a), the result

phrase *tight* is used to indicate that more than one object is unified closely together.² Likewise, the result *into a knot* in (20b) and (21b) suggests that the size of an object is reduced. In both cases, the result phrases serve to further specify the spatial reduction expressed by the verbs. In the sentences in (22), the connection verbs appear in the subjective motion expressions. The compatibility of the verbs with such expressions supports the spatial reduction analysis of the connection verbs.

Consequently, connection verbs allow the co-occurrence of result phrases that further specify the spatial reduction and path phrases that evoke anchored motion.

- (23) a. Amelia rolled up Nina's torn sleeve and tied the tourniquet tight around her upper arm.
- b. Out in the corral, tied so tight to the bid stake in the centre that the Argentines call a palemque that she couldn't even move her head, was the little grey pony.
- c. I should be bound even tighter to my mother.

(= (1))

In these sentences, the result phrases *tight* and *tighter* specify the spatial reduction described by the verbs *tie* and *bind*, respectively. The path phrases, which refer to anchored motion, further specify the spatial reduction. Because all the events described by the verbs, the result phrases and the path phrases refer to a unified change, no UPC violation results.

² Although Washio (1997) calls the expression *tight* in (21) a "spurious" result phrase, Iwata (2006) argues that it can be analyzed as a type of result phrase. I follow his analysis here.

5. Spatial Reduction and Translational Motion

This section provides further evidence for the spatial reduction analysis of connection verbs through the comparison with verbs that express translational motion. Both anchored motion and translational motion can be expressed by path phrases, so the two types of motion are superficially alike.

(24) John threw the ball into the dugout. (Baker (1996:107))

(25) a. They tied him to a tree and beat him up. (LDOCE)

b. He glared at the boy, daring him to contradict, but he stayed wisely silent as Alistair bound him to the tree, pulling the knots tight.

(Elizabeth English, *Laird of the Mist*)

Sentence (24) denotes a change of location of the ball. This type of motion can be considered translational motion because the ball as a whole moves along the path. Sentences (25a) and (25b) indicate that a man is fastened to a tree. I have argued in the previous section that the motion involved in (25) is anchored motion, although the sentence patterns in (24) and (25) are significantly alike. This apparent similarity makes it difficult to distinguish between the motion types.

A close scrutiny of the two types of motion, however, reveals four crucial differences, all of which follow from the distinct motion types.

Spatial reduction in terms of spatial combination presupposes the physical contact between more than one entity that is combined. If there were no physical contact between the entities, no spatial combination would result. For this reason, it is predicted that spatial combination verbs are incompatible with path phrases that do not entail physical contact. The presence or absence of physical contact can be confirmed using

the preposition *toward*, which entails no physical contact between entities. Consider the following:

- (26) John threw the ball toward the fence. (Baker (1997:107))
- (27) a. * John tied the board toward the tree.
b. * John bound the board toward the tree.

The verb *throw* is compatible with a path phrase headed by *toward*. This compatibility explicitly suggests that the verb *throw* does not lexically entail physical contact.³ The verbs *tie* and *bind*, on the other hand, do not go along with such a path phrase, suggesting that they lexically entail the physical contact meaning.

Spatial combination is a change in which more than one entity is combined together. When we want to separate the entities that are combined together, we can achieve this purpose by, say, cutting the entities apart. By contrast, if such entities were not combined together, we could not cut them apart. This logic is supported by the following data:

- (28) * John threw the ball into the box, and Mary cut it off.
- (29) a. John tied the box to the tree, and Mary cut it off.
b. John bound the chair around the tree, and Mary cut it off.

Tying the box to the tree presupposes that the box and the tree are combined together. Thus, we can separate them by cutting the box off. Similarly, binding the chair around

³ The verb *put* also expresses translational motion. This verb, in contrast with the verb *throw*, entails physical contact, as exemplified by the incompatibility with *toward the bed*:

- (i) ?* Harpo put the book toward the bed. (Jackendoff (1990:79))

the tree entails that the chair is attached to the tree. Again, we can divide them by cutting the chair off. No contradiction emerges in (29). On the other hand, sentence (28) is illicit because throwing the ball into the box does not entail their spatial combination, which is necessary for cutting the ball off the box.

Jackendoff (1990:112) notes that verbs that entail attachment are compatible with path phrases headed by the preposition *to*.

(30) The gum { adhered / stuck } to the table. (Jackendoff (1990:112))

The verbs *adhere* and *stick* lexically include the meaning of attachment, and they are compatible with the preposition *to*. On the basis of this observation, we can predict that spatial combination verbs are compatible with path phrases that are headed by the preposition *to* because spatial combination inherently involves attachment. This prediction is justified by the following examples:

(31) * John threw the ball to the wall. (Kodama (2004:47))

(32) a. They tied him to a tree and beat him up. (= (25a))

 b. He glared at the boy, daring him to contradict, but he stayed wisely
 silent as Alistair bound him to the tree, pulling the knots tight.

(= (25b))

The spatial combination verbs go along with path phrases whose head is *to*, as in (32). On the other hand, the verb *throw* is incompatible with such a path phrase, as in (31).

Verbs that express spatial combination require the intervention of instruments to fasten one thing to another (cf. Jackendoff (1990:113), Levin (1993:163), Pinker

(1989:126)). For example, the eventuality denoted by the verb *tie* or *bind* requires an instrument such as a rope. Without such an instrument, we could not tie or bind, say, a chair around a tree. By contrast, the verb *throw* does not entail spatial combination, and therefore, this verb does not require the intervention of an instrument that is used to attach one thing to another. The presence or absence of some intermediate instrument in the lexical meaning of the verbs can be confirmed by the realization of these instruments in *with* phrases:

- (33) * John threw the book into the box with a rope.
 (= John caused the book to be tied to the box with a rope.)
- (34) a. His bicycle is leaning against the sapodilla tree. He has tied it to the tree trunk with brown rope. (Elizabeth Nunez, *Anna In-Between*)
 b. He bound the splints to the leg with a small rope.
 (J. M. Sampson, *Emerald Sword*)

In sentence (34a), tying the bicycle to the tree is performed by using the rope. In sentence (34b), likewise, he uses the rope as an instrument to bind the splints to the leg. The sentence in (33), on the other hand, does not allow the presence of the instrument *a rope*.⁴

⁴ Although the verb *put* and the spatial combination verbs share the physical contact meaning, they can be differentiated by the presence or absence of the spatial combination entailment.

- (i) John put the book on the table, and Mary cut it off.
 (ii) * Gummo put the book to the floor. (Jackendoff (1990:79))
 (iii) * John put the book on the table with glue. (In the meaning that “John attached the book to the table using glue.”)

All of these data point to the absence of spatial combination meaning from the verb *put*. As a result, it does not allow the co-occurrence of a result phrase, as shown below:

- (iv) * John put the glass tight on the table.

In this way, we have observed that spatial combination verbs show four characteristics, all of which follow from their spatial combination meaning.

Note that spatial combination verbs may take a direct object that refers to an instrument that is usually used to fasten one thing to another (cf. Iwata (2008a:75)).⁵ For example, observe the following:

- (35) a. She tied a scarf over her head. (LDOCE)
b. One binds a handkerchief round the arm. (Saito (1984:73))

The referents denoted by the object NPs *a scarf* and *a handkerchief* in (35) can be used as instruments to fasten one thing to another. In these sentences, however, these entities themselves participate in the change of location. The roles of the entities in the object NP position in these sentences are different from those in the sentences in (34); the former plays the role of locatum as well as instrument, whereas the latter is locatum only. Hereafter, we refer to the type of sentences, as in (35), in which the referent of the object NP plays the roles of locatum and instrument, as in instrument-object sentences, and the type of sentences, as in (34), in which the referent denoted by the object NP is

(cf. John put the glass tightly on the table.)

⁵ Iwata (2008a:75) points out that the verb *tie* can take as its object either locatum or location NPs. For example, consider the following:

- (i) a. He tied the string around the package.
b. He tied the package with string. (Iwata (2008a:75))

Sentence (ia) includes the locatum object NP *the string*, and sentence (ib) includes the location object NP *the package*. The participant denoted by the locatum NP is an entity that moves to somewhere. The referent denoted by the location NP, on the other hand, is an entity that takes the part of the location to which the referent denoted by the locatum NP moves. In sentence (ia), the string is fastened to the package, so the string participates in the change of location. The package in sentence (ib), on the other hand, does not move in itself, so the package does not participate in the change of location. Instead, the package in sentence (ib), as well as in (ia), is the location to which the string moves.

locatum only, as in locatum-object sentences. Although the status of the participants in object NP position is different between instrument-object and locatum object sentences, both types of sentences include the spatial combination meaning.⁶ In fact, the instrument-object sentences also exhibit four characteristics that are shared by locatum-object sentences: the compatibility with *and Mary cut it off*, the incompatibility of the verbs with *toward*, the compatibility of the verbs with *to*, and the involvement of the instrument used to fasten one thing to another.

First, instrument-object sentences can also be followed by *and Mary cut it off* without contradiction:

- (36) a. John tied the rope around the tree, and Mary cut it off.
b. John bound the bandage around his head, and Mary cut it off.

Second, instrument-object sentences, as well as locatum-object sentences, are incompatible with path phrases headed by *toward*, as shown below:

- (37) a. * John tied the rope toward the tree.
b. * John bound the rope toward the tree.

Third, instrument-object sentences are compatible with path phrases that are headed by the preposition *to*, as shown below:

⁶ Some verbs that include the attachment meaning have inchoative uses (cf. Jackendoff (1990:112)). In this case, the entities that include both locatum and instrument roles in instrument-object sentences or that include only the locatum role in locatum-object sentences are denoted by NPs in the subject position. For example, the verb *attach* has an inchoative use, so the entity that includes the locatum and instrument roles is in the subject NP position, despite of the name of this sentence type, as in (i):

- (i) The morning breeze has died completely and my prickly grey shirt attaches to my spine.
(BNC)

- (38) a. He tied the rope to the tree and tied Blacky there too so that the reserve of meat could be guarded against marauders.

(Jack Kane, *Napoleon Vs. the Priests*)

- b. (?)John bound the rope to the tree.

In these sentences, the participants denoted by the object NPs are instrument as well as locatum.⁷

Fourth, instrument-object sentences also involve the intervention of some instrument that is used to fasten one thing to another because the participants denoted by the object NPs are the instruments by themselves.

In this way, I have argued that both instrument-object and locatum-object sentences entail spatial combination. Note that the sentences in (23), repeated here as (39), are locatum-object sentences, in which the referent of the object NPs serves as locatum as well as instrument.

- (39) a. Amelia rolled up Nina's torn sleeve and tied the tourniquet tight around her upper arm.
- b. Out in the corral, tied so tight to the bid stake in the centre that the Argentines call a palemque that she couldn't even move her head, was the little grey pony.
- c. I should be bound even tighter to my mother.

These sentences allow the co-occurrence of a path phrase and a result phrase, resulting in no UPC violation. In sentence (39a), for example, the path phrase *around her upper*

⁷ Iwata (2008a:75) notes that the locatum as an object variant of the verb *bind* is marginal.

arm expresses the place to which the tourniquet, which is instrument as well as locatum, is attached. This attachment is further specified by the result phrase *tight*. Therefore, in this sentence, the change of state denoted by *tight* and the change of location denoted by *around her upper arm* are not independent of each other.

My claim that the result phrase *tight* in these sentences further specifies the attachment meaning is supported by the following examples:

- (40) a. * John tied the rope tight to the tree with glue.

(In the meaning that “John tied the rope tight, and then he attached it to the tree with glue”.)

- b. ?? John bound the rope tight to the tree with glue.

(In the meaning that “John bound the rope tight, and then he attached it to the tree with glue”.)

In these sentences, the result phrase *tight* does not modify the attachment meaning but modifies the event of tying a knot before attaching the rope to the tree. In this case, the change of state denoted by *tight* and the change of location denoted by the path phrase *to the tree* are not in a further specification relation, hence, the unacceptability. This fact suggests that the result phrase *tight* in these sentences must modify the attachment meaning.

Thus far, we have argued that the verbs *tie* and *bind* allow the co-occurrence of a result phrase and a path phrase because they express spatial combination. Under this analysis, it is predicted that verbs such as *attach*, *tape* and *glue*, which inherently involve attachment meaning, are also compatible with result phrases and path phrases that further specify the attachment meaning because attachment can be considered a

type of spatial combination. This prediction is borne out by the following data:

- (41) a. The 1 × 4 on the lower sides of the horses keeps the horses from being attached tight to the handrail walls, yet still gives you a solid place to attach the handrail to the horse.

(Mark Currie, *Rough Framing Carpentry*)

- b. The heavy leather mitten, taped tight to his arm, hung heavy from his hand.

(Robert Lundy, *The Index*)

- c. Wood boards, stacked and glued tight to each other, ran its entire length, curving to a pointed bow.

(Thomas A. Joseph, *Song of the Tides*)

The result phrase *tight* in these sentences modifies the meaning of attachment. For example, the result phrase *tight* in sentence (41a) modifies the state of the horses being fastened to the handrail walls. Likewise, *tight* in sentences (41b) and (41c) also modifies the state of the mitten and the wood board being fastened to his arm and the board, respectively. Furthermore, the path phrases in these sentences specify the place to which these objects are attached.⁸

⁸ Further parallel behavior between spatial combination verbs and verbs that express attachment can be exemplified by the existence of their antonym, as well. Verbs that involve attachment meaning have an antonym that expresses detachment:

- (i) Harry { detached / unglued / disconnected / unfastened } the bit of paper from Bill.
(cf. Jackendoff (1990:113))

Sentence (i) expresses the meaning that the bit of paper comes off Bill. The verbs *detach*, *unglue*, *disconnect* and *unfasten* are compatible with this change of location meaning because the meaning of detachment presupposes the change of location. The antonym of the verb *tie* can also express the change of location meaning in terms of detachment, as shown in (ii):

- (ii) We pulled off the sheets and untied the prisoner from the post. (BNC)

Change of state verbs such as *freeze*, *harden*, and *melt* are also predicted to be compatible with a change of location expression without violating the UPC because the change of state evoked by them can potentially trigger spatial combination. When something becomes solid by freezing or hardening, it can attach to another object. Likewise, when a substance becomes liquid by melting, it can attach to another. This prediction is justified by the following data:

- (42) a. There was one story about a man frozen solid to the wall of an ice cave, glazed like a donut by a two-inch sheen of ice.

(Ronald Malfi, *The Ascent: A Novel of Survival*)

- b. Philip slouched down in the chair and kicked at a blob of wax that had hardened to the floor. (Mary Gagnon, *Are Those Your Shoes?*)

- c. The rubber glove I was wearing burned then melted to my hand.

(Crystal L Narby, *Daddy's Little Princess*)

- d. The plastic handle melted to her hand and she screamed out in pain as it burnt her flesh.

(Dale Cusack, *Grace and the Drawl Invasion of Earth*)

The verbs *freeze*, *harden* and *melt* in the sentences denote change of state. For example, the verbs *freeze* and *harden* mean that something becomes hard or solid. The verb *melt* means that something becomes liquid. The change of state denoted by the verbs can be incorporated into spatial combination, when the change of state expressed by the verbs is a necessary condition for the spatial combination. In sentence (42a), for example, the

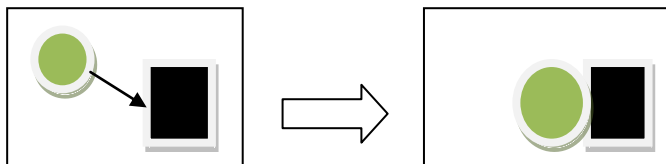
Sentence (ii) expresses the change of location in which the prisoner is detached from the post. This change of location is inherently involved in the detachment described by the verb *untie*. In this way, verbs such as *attach* and the verb *tie* have antonyms that uniformly express detachment, further confirming the uniform analysis of the two types of verbs.

change of state of a man is required in the event of attaching it to the window. The same is also true of (42b-d). In sentence (42b), the event of the wax being attached to the floor is due to the change of state of the wax. Substances such as rubber and plastic can attach to something when they become liquid, and therefore, the verb *melt* is compatible with directional phrases that denote the attachment meaning in sentences (42c) and (42d). In sentence (42a), the attachment meaning is further specified by the path phrase *to the wall of an ice cave*.⁹

In this section, I have observed that the verbs *tie* and *bind* express spatial combination, and this semantic property allows them to co-occur with a result phrase and a path phrase that further specify the spatial combination meaning.

The image of spatial reduction in terms of spatial combination is shown in (43):

(43) The spatial reduction with attachment:



→: The motion that accompanies the reduction

■: A fixed location

○: The entity which is attached to the fixed location

⁹ The change of state verb *melt* is also compatible with the detachment meaning when the change of state denoted by the verb is required to cause the detachment, as shown below:

- (i) Snow and icicles melted off the roofs of the miners' village;...
(Patricia A. McKillip, *Harrowing the Dragon*)

Snow and icicles are frozen substances, so they can remain attached to something in their solid state. When they become liquid, however, they come off something, as in sentence (i). The change of state denoted by the verb *melt* is required to cause the event of detachment, so in this sentence, the change of state expressed by *melt* and the change of location denoted by the path phrase *off the roofs of the miners' village* are not independent of each other. In fact, the former is included in the latter. That is, there exists a further specification relation between the change of state denoted by *melt* and the change of location expressed by the path phrase.

The motion of the circle (○) is included in the change of state in terms of unification of the circle (○) and the box (■). The motion can be modified by a path phrase.

6. Conclusion: Symmetry and Asymmetry of the Change of Spatial Extent

In chapter 3, I argued that verbs such as *break*, which can express physical separation, are compatible with path phrases that further specify the change of state. Physical separation is a subtype of spatial extension. This chapter discusses the opposite change, spatial combination, which is a subtype of spatial reduction.

Physical separation and spatial combination each have two patterns, which are illustrated in the following figures:

Figure 3. Symmetric separation

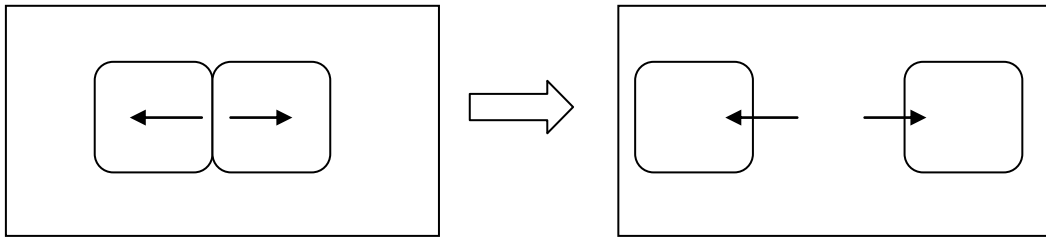


Figure 4. Asymmetric separation

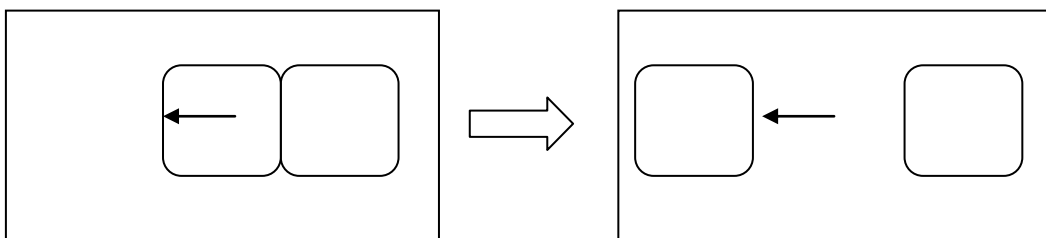


Figure 5. Symmetric combination

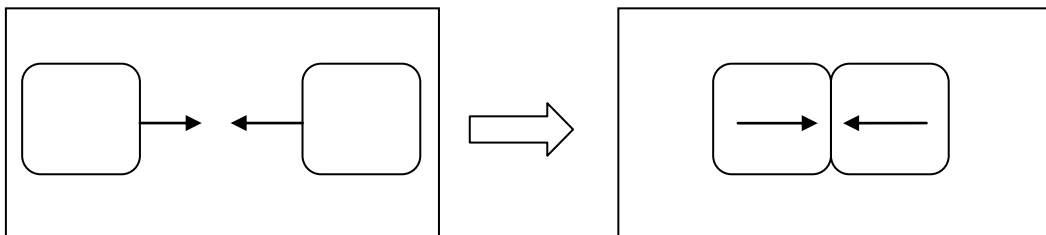
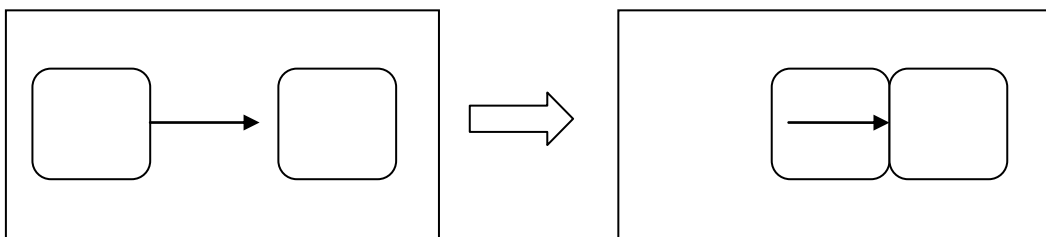


Figure 6. Asymmetric combination



In the symmetric separation, there is no fixed location from which one entity detaches. Rather, both move in the opposite directions, and the two entities become separated. In the asymmetric separation, one of the entities detached from the other is in its fixed position, and the other entity moves and separates from it. In the symmetric combination, both entities move toward each other and combine together. In the

asymmetric combination, one of the two entities is in its fixed position, the other entity moves toward it, and they combine together.

Examples corresponding to the four figures are shown in (44):

- (44) a. The glass shattered apart, jangled to the floor.
(Peter Dawson, *Royal Gorge*)
- b. Kelly broke the branch off the tree. (Rappaport and Levin (1998:123))
- c. Liza retrieves them to tie his hands together.
(Fillmore et al. (2003:305))
- d. He ... tied the driving wheel to Pete's cardboard box with string.
(Fillmore et al. (2003:301))

Sentence (44a) indicates that pieces of the glass scatter after the glass shattered. In this sentence, there is no fixed place, and the change of location of the pieces of the glass can be considered symmetric. In (44b), on the other hand, the tree is fixed at a particular place, and the branch is detached from it. The motion involved in the detachment is asymmetric. In sentence (44c), both of his hands are moved and put together symmetrically, while in (44d), the driving wheel is attached to Pete's cardboard box asymmetrically (Fillmore et al. (2003:301)).

Chapter 5

An Event-based Account of the Unique Path Constraint Effect

1. Introduction

It has been noted that a single clause may not include a change of state expression and a change of location expression (Goldberg 1991, 1995, Levin and Rappaport 1995, Tortora 1998, Iwata 2006 among others).

- (1) a. Sam kicked Bill black and blue.
- b. Sam kicked Bill out of the room.
- (2) a. * Sam kicked Bill black and blue out of the room.
- b. * Sam kicked Bill out of the room black and blue.

(Goldberg 1991:368)

The result phrase *black and blue* in sentence (1a) expresses a resultant state of the referent denoted by the object NP *Bill*. Similarly, the directional phrase *out of the room* in sentence (1b) expresses a resultant location of *Bill*. Note that when the result phrase and the directional phrase co-occur in a single clause, as in (2), the sentence becomes unacceptable.

Based on this observation, Goldberg (1991) proposes the Unique Path Constraint (henceforth, the UPC):

(3) The Unique Path Constraint (UPC):

If an argument X refers to a physical object, then more than one distinct path cannot be predicated of X within a single clause. The notion of a single path entails two things:

- 1) X cannot be predicated to move to two distinct locations at any given time t .
- 2) The motion must trace a path within a single landscape.

(Goldberg 1991:368)

The UPC prohibits the co-occurrence of a change-of-state expression and a change of location expression in a single clause when the change-of-state event and the change of location event occur simultaneously. Crucially, the UPC rules out the sentences in (2) in terms of the time relation regarding whether the two distinct events occur at the same time. Goldberg (1991) argues that the examples in (2) are unacceptable because the result phrase and directional phrase co-occur in a single clause, and the events denoted by them occur at the same time. Importantly, the UPC is formulated on the basis of time relation (whether two events happen at the same time) between two events.

The purpose of this chapter is to further confirm that the hierarchical event structure theory gives a straightforward account of the UPC effect. I show that Goldberg's (1991) time-based account of the UPC effect faces several empirical problems and does not provide an adequate explanation of the co-occurrence restriction on change-of-state expressions and change of location expressions. I argue that what fundamentally underlies the UPC effect is an event relation (whether one event causes the other), not a time relation. The UPC effect follows from the hierarchical event structure theory.

The organization of this chapter is as follows. Section 2 critically reviews the UPC account and notes crucial empirical problems. Section 3 proposes an event-based analysis of the UPC effect, and argues that the problems posed in section 1 can be accounted for. Finally, I provide concluding remarks in section 4.

2. Counterarguments to the UPC Account

The UPC account proposed by Goldberg (1991) aims to explain the co-occurrence restriction

on change of state expressions and change of location expressions. However, the UPC account, as indicated in the previous section, immediately faces two serious empirical problems, both of which arise because the UPC is formulated on the basis of the time relation regarding whether the two distinct events occur at the same time.

First, the examples in (2) are unacceptable even if Bill's becoming black and blue and his leaving the room do not occur at the same time, as shown below:

- (4) (In the situation where the event of Bill's becoming black and blue and that of his leaving the room do not occur simultaneously.)
- a. * Sam kicked Bill black and blue out of the room.
 - b. * Sam kicked Bill out of the room black and blue.

These sentences show that the co-occurrence of the result phrase and the directional phrase makes (4) unacceptable, regardless of whether the two events occurred simultaneously.

Second, the following examples are acceptable under the interpretation where the occurrences of a change of state event and a change of location event are simultaneous:

- (5) a. John *squeezed* the rubber ball out of shape into the jar.
- b. John *squashed* the rubber ball out of shape into the jar.

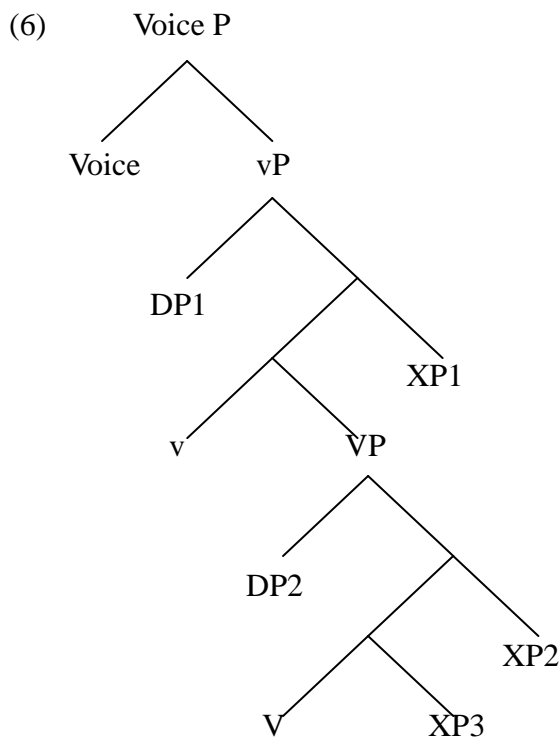
These sentences describe both the motion of the rubber ball, which is denoted by *into the jar*, and its change of state, which is expressed by *out of shape*. The change of state of the rubber ball occurs by its moving into the jar, so the change of state event and the change of location event occur at the same time in these sentences. The UPC would incorrectly predict that these sentences are unacceptable.¹

¹ Similarly, the change of state verb *burn* is also compatible with a path phrase, as shown below:

The two facts observed in this section strongly suggest that the UPC is not empirically adequate. Importantly, its inadequacy emerges because it is based on the time relation. In the next section, I show that the UPC effect is predictable from the hierarchical event structure theory.

3. An Event-based Account of the UPC effect

Under the hierarchical event structure theory, only two types of event structural relations are posited: a causal relation and a further specification relation. The relation of c-command between two event-denoting expressions results in a causal relation between them (i.e., causality), whereas the local relation of mutual c-command between them is interpreted as a further specification relation (i.e., identity).



-
- (i) A lot of the bullets were phosphorescent or something because they burned through the air like fireworks, ... (John Marsden, *The night is for hunting*)

In this sentence, the change of state of the bullets denoted by the verb *burn* occurs in the process of the change of location denoted by the path phrase *through the air*; the bullets' flying through the air caused them to burn. In this case, too, the change of state expressed by the verb and the motion denoted by the path phrase happen at the same time, violating the UPC.

- (7) [[[V XP3] XP2] XP1]...]
- a. c-command relation: causality
- b. mutual c-command relation: identity

The contrast in acceptability between (2) and (5) naturally follows from the hierarchical event structure theory. Two event-denoting expressions may co-occur in a single clause when they are either in a further specification relation or in a causal relation.

First, the sentences in (2) are unacceptable because they include two event-denoting expressions *black and blue* and *out of the room*, which are neither in a further specification relation nor in a causal relation.

- (8) a. * Sam kicked Bill black and blue out of the room.
- b. * Sam kicked Bill out of the room black and blue.

(= (2))

There exists no relation that licenses the two events, so these sentences become unacceptable.²

Note that the unacceptability of the sentences in (8) is not due to the co-occurrence of the two event-denoting expressions in addition to the verb. When two such event-denoting expressions are in a further specification relation, their co-occurrence is possible, as shown below:

² The path phrase *out of the room* and the result phrase *black and blue* denote result events that are caused by the event of Sam kicking Bill. In other words, the change of location event and the change of state event are not in a causal relation, as both are equally caused by the same event.

- (i) a. Sam kicked Bill out of the room.
- b. Sam caused Bill to go out of the room by kicking him.
- (ii) a. Sam kicked Bill black and blue.
- b. Sam caused Bill to become black and blue by kicking him.

Furthermore, the path phrase and the result phrase evoke two distinct events, so they are not in a further specification relation.

- (9) He nailed the door closed shut. (Goldberg (1991:371))

In this sentence, co-occurrence of the two event-denoting expressions *closed* and *shut* is possible because the latter further specifies the meaning of the former.

Next, two event-denoting expressions are compatible in a single clause when they are in a causal relation. The sentences in (5) confirm this point.

- (10) a. John *squeezed* the rubber ball out of shape into the jar.
b. John *squashed* the rubber ball out of shape into the jar.

(= (5))

The path phrase *into the jar* refers to a causing event, and the result phrase *out of shape* describes a result event. This event structural difference between the two event-denoting expressions is supported by the following paraphrase:

- (11) John caused the rubber ball to become out of shape *by pushing it* into the jar.

The sentences in (10) can be paraphrased into sentence (11). In (11), the main clause *John caused the rubber ball to become out of shape* refers to a result event, whereas the subordinate clause *by pushing it into the jar* denotes a causing event. Here, the path phrase *into the jar* is involved in the subordinate clause denoting the causing event, and the result phrase *out of shape* is included in the main clause, which refers to the result event.

Crucially, the analysis of the UPC effect presented in this section does not rely on the time relation between two events, but on their event relation. Consequently, the system of hierarchical event structure predicts that the co-occurrence of distinct two event-denoting expressions is possible when the two distinct events are in a causal relation, regardless of

whether they happen at the same time. This prediction is borne out by the following data.

- (12) a. John broke the vase into pieces against the wall.
b. John broke the vase into pieces onto the floor.

These sentences include a path phrase and a result phrase. The path phrases *against the wall* and *onto the floor* refer to causes of change of state expressed by the result phrase *into pieces* (in combination with the verb). In fact, sentences (12a) and (12b) can be paraphrased into sentences (13a) and (13b), respectively:

- (13) a. John broke the vase into pieces by hitting it against the wall.
b. John broke the vase into pieces by dropping it onto the floor.

These paraphrases, which include a subordinate clause introduced by the preposition *by*, explicitly show that the result phrase denotes a result event, whereas the path phrases refer to causing events.

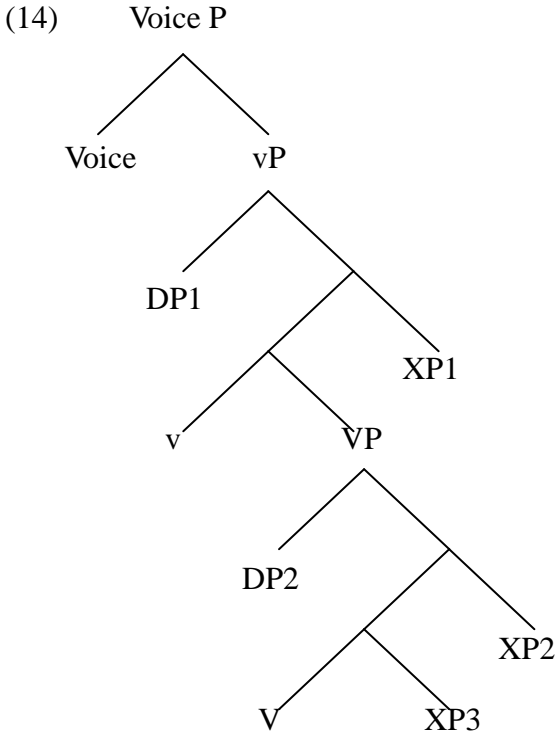
Note that change of state and change of location do not happen at the same time in the sentences in (12); the change of location of *the vase* is followed by its change of state in these sentences. The UPC cannot make any prediction about the acceptability of these sentences because it can make a prediction only when the occurrence of two events described in a clause is at the same time.

In this way, we have observed that the hierarchical event structure underlies and constrains the co-occurrence of a change of state expression and a change of location expression in a single clause. The UPC effect surfaces when more than one distinct event-denoting expression, whose event is neither in a further specification relation nor in a causal relation, co-occurs in a single clause. The rest of this section provides evidence for the

hierarchical event structure analysis of the UPC effect.

3.1. XPs

The hierarchical event structure has at least three positions to which event-denoting expressions (i.e., XPs) can be adjoined. Thus, it is predicted that the verbs we have discussed in this chapter are also compatible with such XPs.



(= (6))

In this section, I will clarify what types of event-denoting expressions are associated with each XP positions in the hierarchal event structure.

I assume that the italicized expressions in the following sentences are associated with XP1.

[XP1]

- (15) a. John broke the vase *with a hammer*.
b. John shattered the vase *with a hammer*.
- (16) a. John squeezed the rubber ball *with a hammer*.
b. John squashed the rubber ball *with a hammer*.

These expressions are situated above V in the hierarchical event structure, so they evoke the cause of the change of state denoted by the verbs.

The path phrases denoting causes or means that I have discussed in this chapter, as exemplified by the italicized expressions, are associated with the XP2 position.

[XP2]

- (17) a. John broke the vase *onto the floor*.
b. John shattered the vase *onto the floor*.
- (18) a. John squeezed the rubber ball *into the jar*.
b. John squashed the rubber ball *into the jar*.

Again, they are situated above V in the hierarchical event structure. Thus, the events expressed by these path phrases are in a causal relation with the events of the verbs.

What occupies the XP3 position is a result phrase, such as the following italicized expressions:

[XP3]

- (19) a. John broke the vase *into pieces*.
b. John shattered the vase *into pieces*.
- (20) a. John squeezed the rubber ball *out of shape*.

- b. John squashed the rubber ball *out of shape*.

The result phrases are in a non-symmetric relation with the V, so the events denoted by the result phrase and the V are in a further specification relation.

In this way, three types of event-denoting expressions can be associated with distinct syntactic positions, and their interpretations are consistent with the syntactic positions.

3.2. The Order of XPs.

Because the three XP positions are hierarchically arranged, it is predicted that the linear orders of the XPs are determined by their hierarchy. Specifically, XP1 is higher than XP2 or XP3, so it is predicted that the former must follow the latter because a higher position is located farther from the V position.

- (21) [[[[V XP3] XP2] XP1]...]

This prediction is borne out by the following data.

[XP1 and XP2]

- (22) a. John broke the vase against the wall (XP2) with his right hand (XP1).
b. ?? John broke the vase with his right hand (XP1) against the wall (XP2).
- (23) a. John squeezed the rubber ball into the jar (XP2) with his right hand (XP1).
b. ?? John squeezed the rubber ball with his right hand (XP1) into the jar (XP2).

For the co-occurrence of XP1 and XP2, the data show that XP1 must follow XP2. In the sentences in (23), for example, the linear order in which the XP1 *with his right hand* follows the XP2 *into the jar* is licit, whereas the opposite order is illicit. The same is true of the

co-occurrence of XP1 and XP3.

[XP1 and XP3]

- (24) a. John broke the vase into pieces (XP3) with a hammer (XP1).
b. ?? John broke the vase with a hammer (XP1) into pieces (XP3).
- (25) a. John squeezed the rubber ball out of shape (XP3) with his hands (XP1).
b. ?? John squeezed the rubber ball with his hands (XP1) out of shape (XP3).

Again, the order in which XP1 follows XP3 is licit, while the opposite order in which XP3 follows XP1 is illicit.

Likewise, XP2 is situated higher than XP3 in the hierarchical event structure, so the former must follow the latter in their linear order, as exemplified below:

[XP2 and XP3]

- (26) a. John broke the vase into pieces (XP3) against the floor (XP2).
b. ?? John broke the vase against the floor (XP2) into pieces (XP3).
- (27) a. John squeezed the rubber ball out of shape (XP3) into the jar (XP2).
b. ?? John squeezed the rubber ball into the jar (XP2) out of shape (XP3).

The possible order of XP2 and XP3 confirms the hierarchy of the XPs in syntax.

3.3. The Co-occurrence of XPs

Because the three XPs occupy distinct syntactic positions, we can predict that they are compatible in a single clause, so they are as follows:

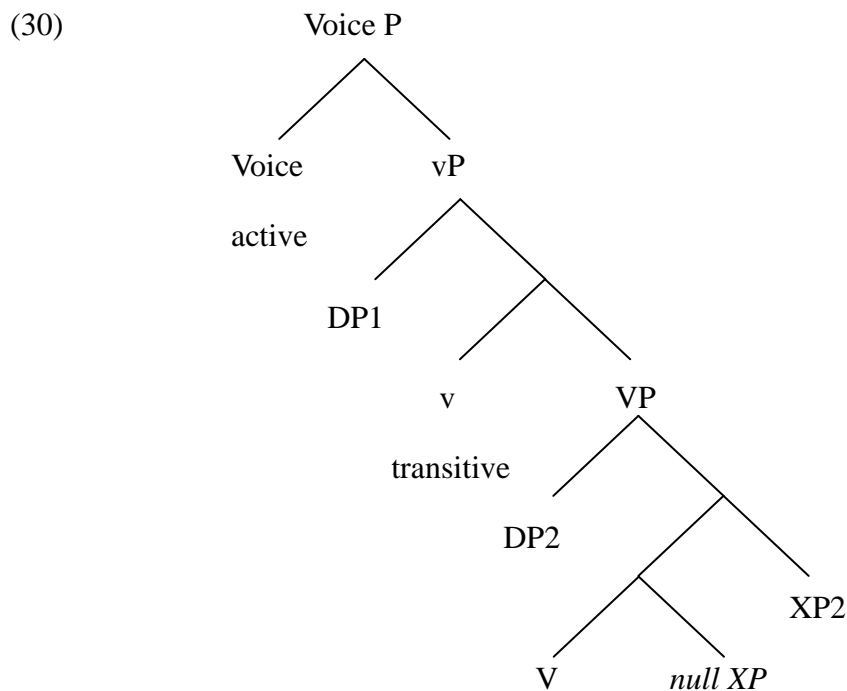
- (28) a. John broke the vase into pieces onto the floor with his right hand.

- b. The vase broke into pieces onto the floor from the earthquake.
- (29) John squeezed the rubber ball out of shape into the jar with his right hand.

These data explicitly show that the three event-denoting expressions are compatible in a single clause.

3.4. Constituency Tests.

Under the system of hierarchical event structure, path phrases that evoke a cause are assumed to be associated with the XP2 position.



Because XP2 is within VP, it is predicted that no syntactic operation that deletes or replaces VP can leave behind the path phrase. This prediction can be confirmed by the following data:

- (31) a. ?? John broke the vase onto the table, and Mary did so onto the floor.
- b. * What John did onto the floor was break the vase.

- c. * John broke the vase against the wall, and Mary did against the floor, too.
 - d. * Who will break the vase onto floor? Mary will onto the floor.
 - e. * John wanted to break the vase onto the floor and break the vase he did onto the floor.
- (32)
- a. ?? John squeezed the rubber ball into the crack, and Mary did so into the jar.
 - b. * What John did into the jar was squeeze the rubber ball.
 - c. * John squeezed the rubber ball into the crack, and Mary did into the jar, too.
 - d. * Who will squeeze the rubber ball into the crack? Mary will into the crack.
 - e. * John wanted to squeeze the rubber ball into the jar and squeeze the rubber ball he did into the jar.

The syntactic operations (i.e., the *do so* substitution, the pseudo-cleft sentence, the VP deletion, and the VP preposing) strongly suggest that the path phrases that serve to evoke a causing event are adjoined within the VP.

3.5. Direct/Indirect Causation

In my system of event structure, there emerges a direct causal relation between two event-denoting expressions when no event-denoting expression intervenes between them ((33a)). An indirect causal relation between two event-denoting expressions follows when the other intervenes between them; in this case, the intervening event-denoting expression serves to evoke a direct cause ((33b)).

- (33) [[[[V XP3] XP2] XP1]...]
- a. XP2 directly causes V-XP3.
 - b. XP1 indirectly causes V-XP3.

The direct/indirect causation can be exemplified by the following data.

- (34) a. John squeezed the rubber ball with his right hand (XP1).
b. John squeezed the rubber ball into the jar (XP2).
c. John squeezed the rubber ball into the jar (XP2) with his right hand (XP1).
- (35) a. John squashed the rubber ball with his right hand (XP1).
b. John squashed the rubber ball into the jar (XP2).
c. John squashed the rubber ball into the jar (XP2) with his right hand (XP1).

In the (a) sentences, the XP1 *with his right hand* is the direct cause of the event of V (i.e., squeezing the rubber ball). In the (b) sentences, likewise, the XP2 *into the jar* is the direct cause. When two XPs co-occur in a single clause, as in the (c) sentences, the hierarchically lower XP evokes the direct cause, and the higher one the indirect cause. Note that the same expression *with his right hand* evokes the direct cause in (a) but the indirect cause in (c). The different interpretations of the same expression show that the interpretation of direct/indirect causation is crucially determined by the hierarchical event structure.

3.6. Direct Cause Interpretation

My claim that path phrases that are associated with XP2 evoke the cause of the event of V can be further confirmed by the selectional restriction on the path phrases. Consider the following:

- (36) a. John squeezed the rubber ball out of shape through the crack.
b. John squashed the rubber ball out of shape through the crack.
- (37) a. * John squeezed the rubber ball out of shape toward the wall.
b. * John squashed the rubber ball out of shape toward the wall.

Note that the sentences in (36), which include the path phrase *through the crack*, are licit, whereas those in (37), which include the path phrase *toward the wall*, are not. The path phrase *through the crack* entails physical contact between the rubber ball and the cracked wall, and this physical contact is the cause of the result event (i.e., squeezing the rubber ball out of shape). Thus, the path phrase in (36) expresses the direct cause of the result event. The path phrase in (37), on the other hand, does not entail physical contact between the rubber ball and the wall, so it fails to express the direct cause of the result event.

The same is true of the following contrast:

- (38) a. John squeezed the rubber ball out of shape into the small hole.
b. # John squeezed the rubber ball out of shape into the big hole.

Sentence (38a) is acceptable because pushing the rubber ball into the small hole can cause it to become out of shape. That is, the motion evoked by the path phrase *into the small hole* is the direct cause of the result event of the V. Sentence (38b), however, is strange when the hole is larger than the size of the rubber ball because pushing the rubber ball into such a large hole does not cause it to become out of shape. That is, the path phrase *into the big hole* is inadequate as an expression that evokes the direct cause.

The data we have observed in this subsection confirm that path phrases that are associated with XP2 evoke the cause of the result event.

3.7. Predication

Instrument PPs, such as *with a hammer*, are adjoined to vP, which includes an external argument, and path phrases that denote cause or means and result phrases are included in the maximal projection that contains the internal argument. Consequently, instrument PPs are predicated of the external argument, whereas path phrases that express cause or means and

result phrases modify the internal argument, as exemplified below:

- (39) a. John squeezed the rubber ball with a hammer.
b. → John (was) with a hammer.
- (40) a. John squeezed the rubber ball into the jar.
b. → The rubber ball (went) into the jar.
- (41) a. John squeezed the rubber out of shape.
b. → The rubber ball (became) out of shape.

These facts further support my claim that instrument PPs, path phrases that denote cause or means, and result phrases are associated with the XP1, XP2 and XP3 positions, respectively.

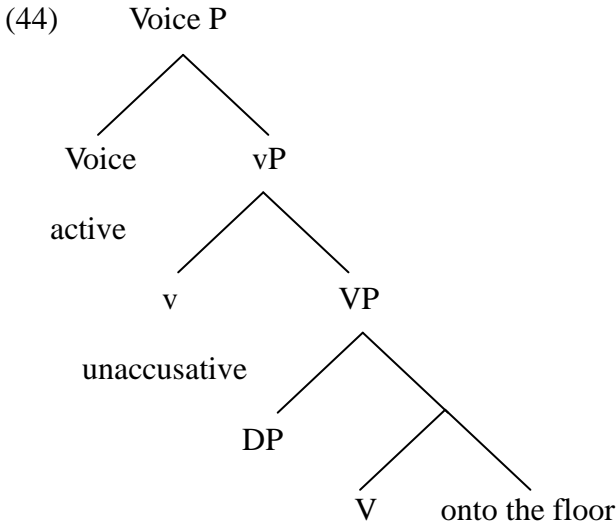
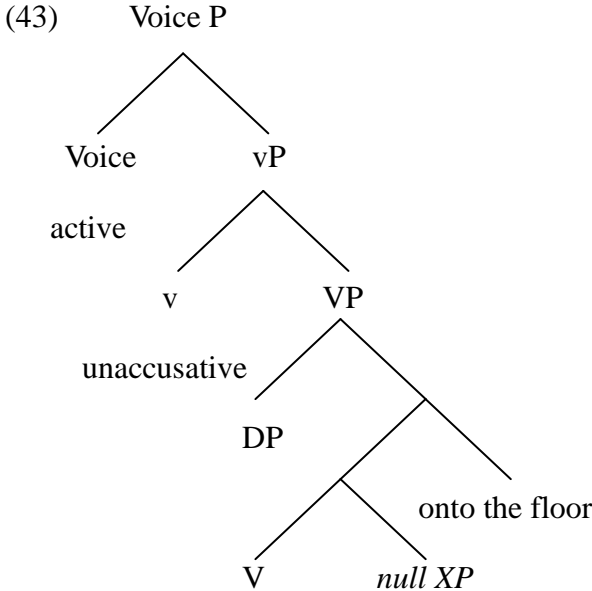
3.8. Ambiguity between XP2 and XP3

In chapter 3, we have observed that path phrases can be associated with the XP3 position when they refer to anchored motion. Thus, it is predicted that some path phrases are ambiguous between the interpretations connected to the XP2 position and the XP3 position. In the former position, the path phrases are interpreted as a cause. In the latter position, on the other hand, they are associated with a further specification interpretation. This prediction can be confirmed by the ambiguous interpretations of the following sentence:

- (42) The vase broke onto the floor.
- a. The vase broke into pieces on the table, and then, its pieces spread and went onto the floor.
- b. The vase fell onto the floor, and then, it broke into pieces.

This sentence is ambiguous between (42a) and (42b). In the (42a) interpretation, the vase

became in pieces, its pieces spread all over the table, and, as a result, some of its pieces fell onto the floor. The motion of its pieces can be considered anchored motion, and this anchored motion is described by the path phrase. Consequently, the path phrase serves to further specify the meaning of the verb. In the (42b) interpretation, on the other hand, the vase dropped onto the floor first, and then it became in pieces. The motion described by the path phrase is the cause of the change of state of the vase. The structures of this sentence can be represented as follows:



The ambiguity of this sentence naturally follows because the path phrase included in it can be associated with either the XP2 position, as in (43), or the XP3 position, as in (44). The interpretation of the sentence varies with the position with which the PP *onto the floor* is associated.

4. Concluding Remarks

In this chapter, I have shown that the co-occurrence restriction of a change of state expression and a change of location expression in a single clause follows from the system of hierarchical event structure. Under this system, only two relations between two events are allowed: a further specification relation and a causal relation. A further specification relation between a change of state expression and a change of location expression is discussed in chapters 3 and 4. This chapter has considered a causal relation between them. A single clause may include a change of state expression and a change of location expression when they are in either relation. When neither event-denoting expressions are in a further specification relation or in a causal relation, the UPC effect results.

Chapter 6

The Argument Realization Patterns of Sound Emission Verbs

1. Introduction

This chapter argues that the hierarchical event structure theory gives a unified account of the argument realization options of sound emission verbs such as *whistle* and *rumble*, further confirming the empirical validity of the theory.

Argument realization options of sound emission verbs are exemplified by the following:

- (1) a. The train whistled. (Folli and Harley (2008:192))
- b. I'm so hungry that my stomach's rumbling. (Lupsa (2003:42))
- (2) a. The bullet whistled *through the window*. (Folli and Harley (2005:115))
- b. Tanks were rumbling *through the streets*. (Lupsa (2003:42))

In (1), the referent of the subject NP produces noises through its internal structure. That is, the cause of the sound emission is internal to the referent of the subject NPs. Hereafter, we call such sentences internally caused sound emission (IC) sentences. In (2), on the other hand, the cause of the sound emission is not internal to the referent of the subject NPs. Rather, the sound evoked by the verbs is produced by the motion of the objects. In (2a), for example, the bullet makes sounds because it flew through the window. The friction between the bullet and the air causes the whistling sounds. In (2b), likewise, the noises are produced by the friction between the tanks and the streets on which they ran. In this way, the cause of the sound emission is external to the referent of the subject NPs. Hereafter, we refer to such sentences as externally caused sound emission (EC) sentences.

Although IC sentences and EC sentences share the same sound emission verbs, there is a crucial difference between them. EC sentences allow the occurrence of a path phrase, as in (2), whereas IC sentences do not, as shown below:

- (3) a. * The car honked down the road.
b. * The dog barked out of the room.
c. * Bill whistled past the house.

In these sentences, the cause of the sound emission described by the verbs is internal to the referent of the subject NP, and the co-occurrence of a path phrase is prohibited.

In this way, EC sentences and IC sentences show crucially distinct behavior regarding the co-occurrence of a path phrase. In the literature, many researchers have presented solutions to this problem (Levin and Rappaport (1995), Verspoor (1997), Goldberg and Jackendoff (2004), Folli and Harley (2005, 2008), Iwata (2008b), among others). Levin and Rappaport (1995), for example, give a lexical semantic analysis, arguing that the sound emission verbs included in the sentences in (1) and (2) are polysemous between the sound emission and motion. According to Levin and Rappaport, the compatibility of the verbs with a path phrase, as in (2), follows because they work as motion verbs. Folli and Harley (2005, 2008), on the other hand, provide a syntactic analysis. They argue that the sound emission verbs in the uses in (2) syntactically license the small clause, and the co-occurring path phrases are analyzed as the small clause predicates.¹

This chapter argues that the path phrases in (2) are XP2 adjuncts in the system of

¹ Folli and Harley (2005, 2008) argue that the path phrase *through the window* in (i) is the predicate of the small clause, as in (ii).

- (i) The bullet whistled through the window.
(ii) [vP v [SC the bullet-through the window]]

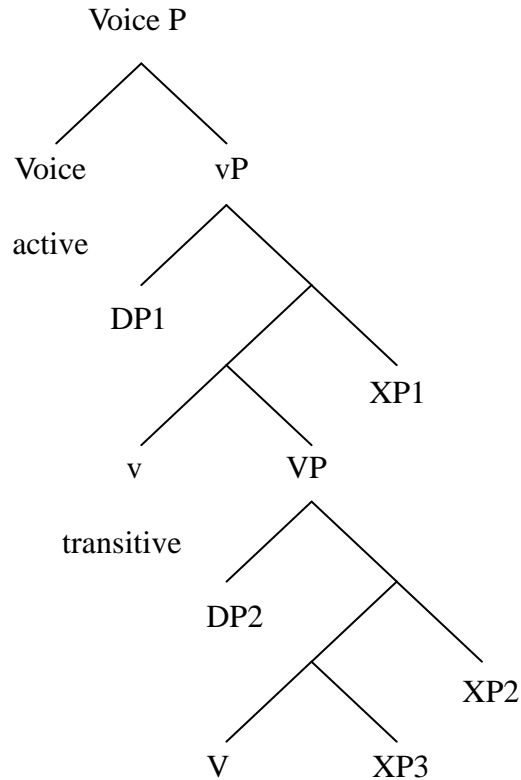
hierarchical event structure. Specifically, the path phrases evoke the cause of sound emission. As an immediate consequence of this analysis, the (in)compatibility of sound emission verbs with a path phrase naturally follows. As a result, it is shown that the argument realization patterns of sound emission verbs empirically justify the hierarchical event structure theory, not the polysemy-based analysis (Levin and Rappaport (1995)) or the small clause analysis (Folli and Harley (2005, 2008)).

The organization of this chapter is as follows. Section 2 proposes the XP2 status of the path phrases that occur in EC sentences. I present six predictions, all of which follow from the proposed analysis. Section 3 provides some consequences of my analysis, and section 4 presents concluding remarks.

2. The Hierarchical Event Structure Analysis

When sound emission verbs co-occur with path phrases, usually the sound emission event of the verbs is caused by the motion denoted by the path phrases. In this chapter, I argue, on the basis of this semantic characteristic, that path phrases that are compatible with sound emission verbs are XP2 adjuncts in the system of hierarchical event structure.

(4)



(5) [[[[V XP3] XP2] XP1]...]

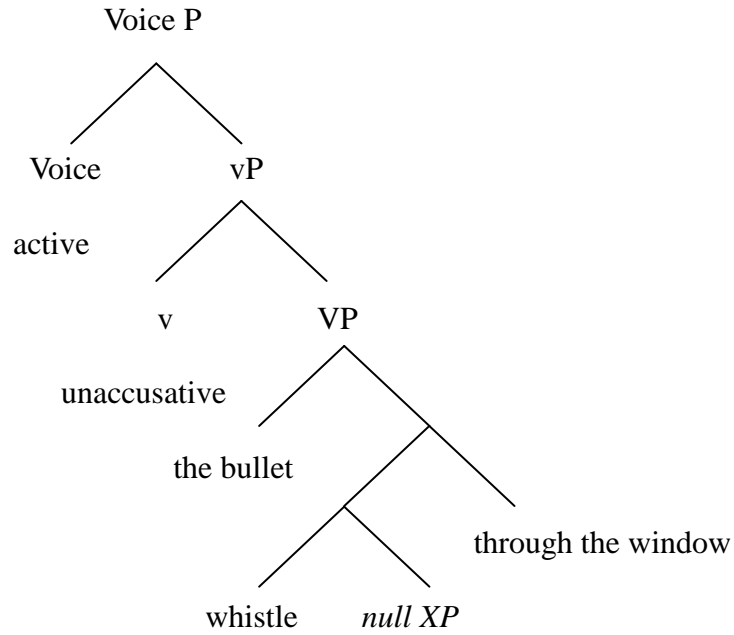
- a. c-command relation: causality
- b. mutual c-command relation: identity

When an event-denoting element c-commands another, the event denoted by the former can be construed as a cause and that denoted by the latter can be interpreted as a result. When two event-denoting elements are in a mutual c-command relation, the relation between the events described by them can be construed as a further specification relation.

Under this analysis, the sentence in (2a) has the following syntactic representation:

(6) The bullet whistled *through the window*. (= (2a))

(7)



In the following subsections, I show that path phrases that co-occur with sound emission verbs exhibit two semantic and four syntactic properties, all of which naturally follow from the hierarchical event structure: (i) the path phrases must evoke the direct causes or means of the result events, (ii) the path phrases are incompatible with expressions that evoke the direct causes or means of the result events, (iii) the path phrases are compatible with result phrases, (iv) the path phrases are omissible, (v) the VP deletion operation cannot leave behind the path phrases, and (vi) the path phrases must follow the result phrases in a single clause. The semantic properties in (i) and (ii) obtain because the path phrases evoke the causes or means of the result events. The syntactic properties in (iii)-(vi) follow from the lower VP-adjunct status of the path phrases.

2.1. Causativity of Path Phrases

First, path phrases that co-occur with sound emission verbs should evoke the cause of the sound because the path phrases are situated in the XP2 position, which is higher than the V in the hierarchical event structure, indicating a causal relation between the XP2 and the V. In fact,

the causative meaning of the path phrases has been indicated by many researchers (Levin and Rappaport (1995), Folli and Harley (2005, 2008), among others). The causative meaning of the path phrases can be made clear by the semantic restriction on the path phrases. Observe the following contrasts:

- (8) a. This truck is extremely heavy, so it always rumbles through the street.
b. * This truck is extremely light, so it can rumble through the air.
- (9) a. The car ran along the road very fast, and banged against the wall.
b. * The car ran along the road very fast, and banged toward the wall.

In (8a), the truck made noise as it ran through the street. The sound emission is caused by the friction between the truck and the street, and the path phrase *through the street* explicitly shows the cause of the sound emission. In (8b), on the other hand, the truck flew through the air. Because the truck cannot produce a rumbling sound by the friction between it and the air, it follows that the path phrase *through the air* does not express the cause of the sound emission. The contrast in acceptability between (8a) and (8b) shows that the path phrases that are compatible with the sound emission verbs must express the cause of the sound emission. The same is true of the contrast in (9). The banging sound presupposes physical contact between two hard objects. In sentence (9a), the path phrase *against the wall* explicitly indicates that the car hit the wall, producing the banging sound. In sentence (9b), on the other hand, the path phrase *toward the wall* does not entail the physical contact between the car and the wall. As a result, the unacceptability of this sentence follows.

2.2. Incompatibility of Path Phrases with Cause-evoking Expressions

Second, if path phrases in EC sentences evoke the cause of sound emission, it is predicted that

the path phrases are incompatible with another expression that describe another cause of the sound emission because the co-occurrence of the two cause-evoking expressions results in contradiction. The following data confirm this point:

- (10) a. John clicked the glass against the window.
b. John clicked the glass with a spoon.
c. * John clicked the glass against the window with a spoon.

In sentence (10), John produced a clicking sound by hitting the glass against the window. In sentence (10b), he produced the sound by hitting the glass with a spoon. In this way, both the path phrase against the window and the PP with a spoon serve as cause-evoking expressions. The co-occurrence of the two expressions results in a contradiction, as in (10c).

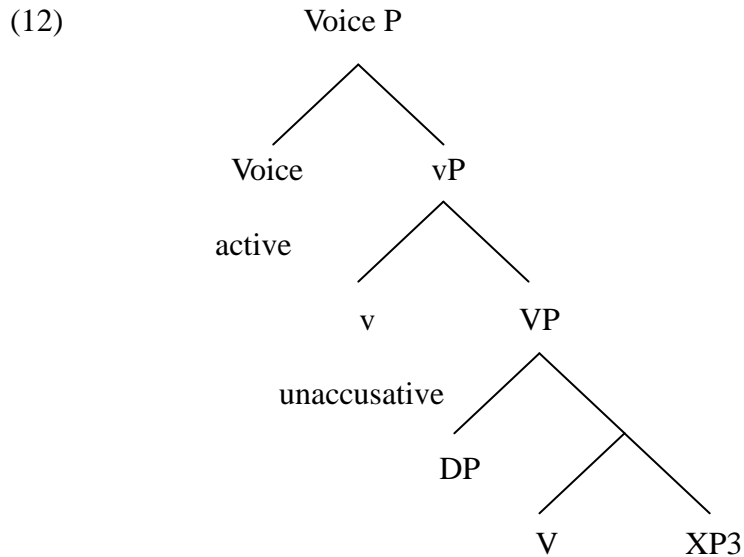
2.3. Compatibility with Result Phrases

Third, the path phrases should be compatible with result phrases because they occupy distinct syntactic positions. In fact, the following examples show that they can co-occur in a single clause:

- (11) a. The winds whistled loud through the lindens so tall, ...
(J. Stewart, *Genevieve*, the underline is mine)
b. One day the chill wind whistled loud through clumps of leafless trees.
(E. Michael, *Queen of the Sun*, the underline is mine)

In the sentences in (11), the sound emission verb *whistle* allows the co-occurrence of the result phrase *loud* and the path phrase in a single clause. Because the sound emission verbs

describe sound emission, result phrases that are compatible with them must further specify the sound emission meaning.



V and XP3 are in a local relation of mutual c-command, so the further specification relation between them automatically follows. Consequently, result phrases that are irrelevant to sound emission are not allowed to co-occur with sound emission verbs.

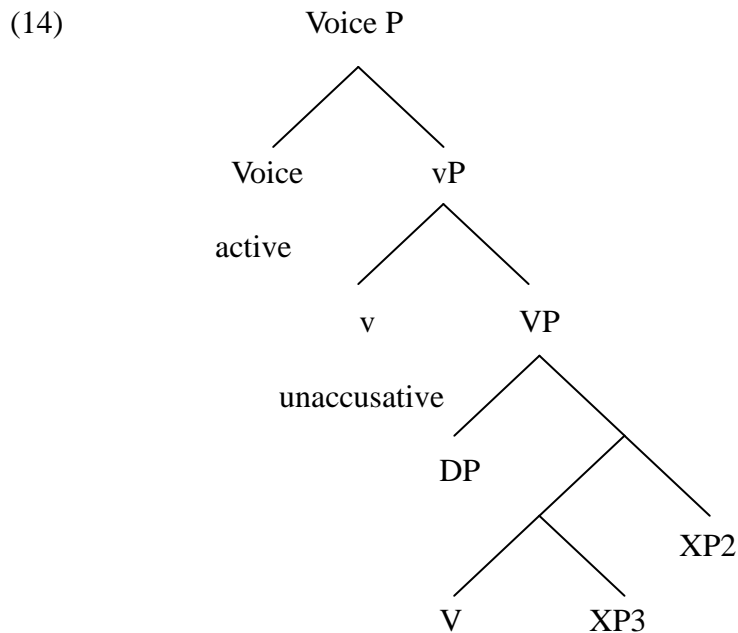
- (13) a. * The door banged to pieces.
 b. * The curtains creaked threadbare.
 c. * The skylight thudded to smithereens.
 d. * The lid clunked flat.

(Levin and Rappaport (1995:192))

The result phrases *to pieces*, *threadbare*, *to smithereens* and *flat* do not further specify the sound emission expressed by the verbs, so these sentences are ruled out.

2.4. The Linear Order Restriction

Fourth, when path phrases and result phrases co-occur in a single clause in EC sentences, it is predicted that the path phrases must follow the result phrases because the former are higher than the latter in the syntactic structures.



This prediction is confirmed by the following contrast in acceptability:

- (15) a. The missile whistled loud (XP3) through the air (XP2).
 b. ?? The missile whistled through the air (XP2) loud (XP3).
- (16) a. The truck rumbled loud (XP3) along the street (XP2).
 b. ?? The truck rumbled along the street (XP2) loud (XP3).

Sentence (15a), in which the path phrase *through the air* follows the result phrase *loud*, is licit, whereas sentence (15b), in which their order is reversed, is not licit. Likewise, the contrast in (16) shows that the result phrase must precede the path phrase.

2.5. Omissibility of Path Phrases

Fifth, given the adjunct status of the path phrases, it is predicted that their occurrence is not obligatory in external cause sentences. This prediction is borne out by the following examples:

- (17) a. The train roared as it approached.
b. The train's wheels hummed as it approached.
(Perlmutter (1978:164))
- (18) Bullets whistled as they flew past. (Hal Williams, *Monkey Blood*)
- (19) The high-powered Dodge patrol car rumbled as it moved slowly over the dirt driveway. (Robert Charles Wilson, *Crooked Tree*)
- (20) The door rattled and rumbled as it slid along the tracks in the rafters above the car. (Joe Hilley, *Double Take*)

The sound emission verbs in these examples are not followed by path phrases. The examples strongly suggest that external cause sentences do not require the occurrence of path phrases.²

² It is often argued that, contrary to my claim, the occurrence of path phrases is obligatory in external cause sentences (Levin and Rappaport (1995), Lupsa (2003), Folli and Harley (2005, 2008), among others).

- (i) The bullet whistled *(into the room). (Folli and Harley (2008:200))
- (ii) a. The boat chugged along the canal.
b. Tanks were rumbling through the streets.
- (iii) a. * The boat chugged.
b. ? Tanks were rumbling.
(Lupsa (2003:42))

These data apparently show that the omission of the path phrases from the external cause sentences is not allowed. The examples in (17)-(20), however, indicate that the co-occurrence of path phrases is not necessarily required to rescue the external cause sentences.

One might argue that these sentences are acceptable because they include expressions that evoke motion such as *as it approached* in (17). The following data suggest that this is not necessarily the case:

- (iv) Bullets whistled, shrapnel burst; big shells burst in huge pillars of earth.
(G. D. Sheffield, *War on the Western Front*)
- (v) (Situation: a truck ran past me.)
I heard a truck rumble, but I don't know where it went.

2.6. Constituency Tests

Finally, it is predicted that constituency tests also point to the XP2 status of the path phrases. XP2 is situated within VP, so no syntactic operation can delete the sequence v-VP, leaving the XP2 adjunct behind. The following data verify this prediction:

- (21) a. * A bullet whistled through the window, and a ball did through the air, too.
b. * A tank rumbled along the ground, and a truck did along the street, too.

These sentences show that the syntactic operation, which deletes only the verbs, is not allowed.

3. Consequence

In the previous section, I have shown that path phrases that are compatible with sound emission verbs are XP2 adjuncts. The XP2 adjuncts evoke the cause of the sound emission because they are positioned above the V in the hierarchical event structure. As an immediate consequence of this event structural analysis, it naturally follows that internal cause sentences do not allow the occurrence of the path phrases. For example, observe the following internal cause sentences:

- (22) a. The car honked.
b. The dog barked.
c. Bill whistled.

These sentences are acceptable, even though they involve neither a path phrase nor an expression that evokes motion.

In these sentences, the referent of the subject NPs produces sound. In other words, the subject NPs express the cause of sound emission. The XP2 adjuncts are also cause-evoking expressions, so the occurrence of the XP2 adjuncts in internal cause sentences results in a contradiction between the two distinct causes. As a result, the unacceptability of the following sentences follows:

- (23) a. * The car honked down the road.
 b. * The dog barked out of the room.
 c. * Bill whistled past the house.

(= (3))

In this way, the system of hierarchical event structure gives a straightforward account of the (in)compatibility of sound emission verbs with path phrases. My analysis does not need to assume the polysemy of sound emission verbs between sound emission and motion (Levin and Rappaport (1995)).³ Under my analysis, the sound emission verbs express sound emission monosemously. Furthermore, it is not necessary to assume the small clause analysis of external cause sentences (Folli and Harley (2005, 2008)), which is empirically inadequate.⁴

³ If sound emission verbs could lexically express motion, they would be compatible with measure phrases and interrogative sentences that ask about the distance of motion, both of which go along with the motion verb *walk*. The following data show that this is not the case:

- (i) a. She walked three miles. (Huddleston and Pullum (2002:690))
 b. ?? The bullet whistled two hundred meters.
 (ii) a. Mary walked to the store.
 b. How far did Sue walk?
 (iii) a. The bullet whistled through the window
 b. * How far did the bullet whistle?

(Folli and Harley (2006))

The unacceptability of (ib) and (iiib) suggests that sound emission verbs do not lexically express motion.

⁴ Under the small clause analysis of external cause sentences, it is predicted that the occurrence of path phrases is obligatory. The examples in (17)-(20), however, explicitly show that this prediction is incorrect.

4. Conclusion

In this chapter, I have shown that the system of hierarchical event structure gives a unified account of the argument realization patterns of sound emission verbs. Sound emission verbs apparently show dual meanings between sound emission and motion. In this chapter, it was shown that the apparent motion meaning of sound emission verbs follows from the system of hierarchical event structure. Specifically, the motion meaning can be attributed to the XP2 adjuncts, which is independently motivated. Consequently, we can give a unified account of the duality of sound emission verbs.

Chapter 7

The Argument Realization Patterns of Disappearance Verbs

The purpose of this chapter is to provide further evidence for the hierarchical event structure analysis of grammatical phenomena through investigations into syntactic realization options concerning verbs that denote disappearance (hereafter, disappearance verbs). In the literature, it has been argued that disappearance verbs show dual meanings (Iwata (2009)): disappearance meaning and motion meaning. Iwata attributes the dual meanings of disappearance verbs to their polysemy. This polysemy-based analysis, however, faces the theoretical problem of complicating the lexical entry of disappearance verbs. This chapter shows that the apparent polysemy of disappearance verbs follows from the system of hierarchical event structure. In this system, the co-occurrence of disappearance verbs with a path phrase can be justified without positing that the motion meaning is lexically encoded in disappearance verbs, and my analysis helps to simplify their lexical entry.

The organization of this chapter is as follows. Section 1 exemplifies dual meanings of disappearance verbs. Section 2 critically reviews Iwata's polysemy-based account. Section 3 argues that the apparent polysemy of disappearance verbs follows from the system of hierarchical event structure. Section 4 presents concluding remarks.

1. Dual Meanings of Disappearance Verbs

In this section, we observe that disappearance verbs such as *disappear* and *vanish* show apparent polysemy between disappearance meaning and motion meaning. These two meanings are exemplified in (1) and (2), respectively.

- (1) a. In the sudden brightness Gabriel could see every tree around him, until the light disappeared just as suddenly, leaving him in the blackest darkness.
- b. She went out laughing, but her smile vanished as soon as she left Sarah.

(BNC)

- (2) a. Bill disappeared down the road.
- b. The witch vanished into the forest.

(Goldberg and Jackendoff (2004:541))

In the sentences in (1), the verbs denote that an object ceases to exist, i.e., the pure disappearance meaning. In sentence (1a), for example, the light ceased to exist. Sentence (1b) shows that her smile fell from her face. In the sentences in (2), on the other hand, the verbs express motion meaning. They co-occur with the path phrases *down the road* and *into the forest*, denoting that Bill went down the road ((2a)) and the witch went into the forest ((2b)). In the latter cases, the disappearance verbs behave like motion verbs.

In this way, the disappearance verbs show apparent polysemy between disappearance meaning and motion meaning.

2. Critical Review of the Polysemy-based analysis of Disappearance Verbs

2.1. Iwata's (2009) Analysis

On the basis of the dual meanings of disappearance verbs, Iwata (2009) claims that the verbs are polysemous between disappearance meaning and motion meaning. His claim is based on the following two facts, which, in fact, do not support his claim, as we see in the next subsection.

First, Iwata argues that disappearance verbs may appear in subjective motion expressions, even if they do not co-occur with path phrases.

(3) Route 80 crosses Iowa.

(4) The road ran straight ahead of us until it disappeared in the mist,...

(Iwata (2009))

In subjective motion expressions, verbs that inherently express dynamic events describe static situations. In (3), for instance, it is denoted that route 80 ranges between both ends of Iowa, although the dynamic verb *cross* is used in this sentence. In parallel fashion, the disappearance verb *disappear* occurs in the subjective motion expression in (4). In this sentence, the road does not cease to exist, although the dynamic verb *disappear* is employed here. Iwata argues that the parallel behavior between motion verbs and disappearance verbs in terms of subjective motion expressions confirms that the latter also lexically entail motion meaning.

Second, disappearance verbs may evoke motion meaning without the co-occurrence of a path phrase, in the same way as motion verbs.

(5) Bill entered.

(6) Frowning, he disappeared with the throng.

(Iwata (2009))

The motion verb *enter* may entail motion in (5), despite the absence of a path phrase. This is because the motion verb itself lexically involves motion meaning. Likewise, the disappearance verb *disappear* may evoke motion meaning in (6), although no path phrase occurs in this sentence. Iwata argues that this parallel behavior suggests that disappearance verbs also lexically include motion meaning in addition to the disappearance meaning.

2.2. Problems with the Polysemy-based Analysis

The two facts presented by Iwata (2009), however, do not support his polysemy-based analysis.

First, the compatibility of a verb with subjective motion expressions does not guarantee that such a verb lexically entails motion because change of state verbs such as *branch*, *cut*, and *widen* can also appear in such expressions.

- (7) a. This artery branches just below the elbow. (Langacker (1987:175))
- b. The first term (2.04) is the point at which the line cuts the vertical axis. (BNC)
- c. The road widens at the junction. (Matsumoto (1996:185))

The change of state verbs in these sentences describe static situations, although they lexically entail dynamic events. The data explicitly show that subjective motion expressions are not restricted to motion verbs but are also compatible with a variety of change of state verbs. Therefore, the fact in (4) cannot guarantee that disappearance verbs entail motion.

Second, change of state verbs such as *break* and *shatter* can also evoke motion, despite the absence of a path phrase.

- (8) a. John broke the vase (onto the floor).
- b. John shattered the glass (onto the floor).

These change of state verbs can appear with a path phrase, denoting a change of location of an object. Even if such a path phrase is omitted, as in (8), the interpretation in which an object shattered or broke as a result of being dropped is possible. In this interpretation, motion meaning is explicitly included, although the co-occurrence of a path phrase is optional. This

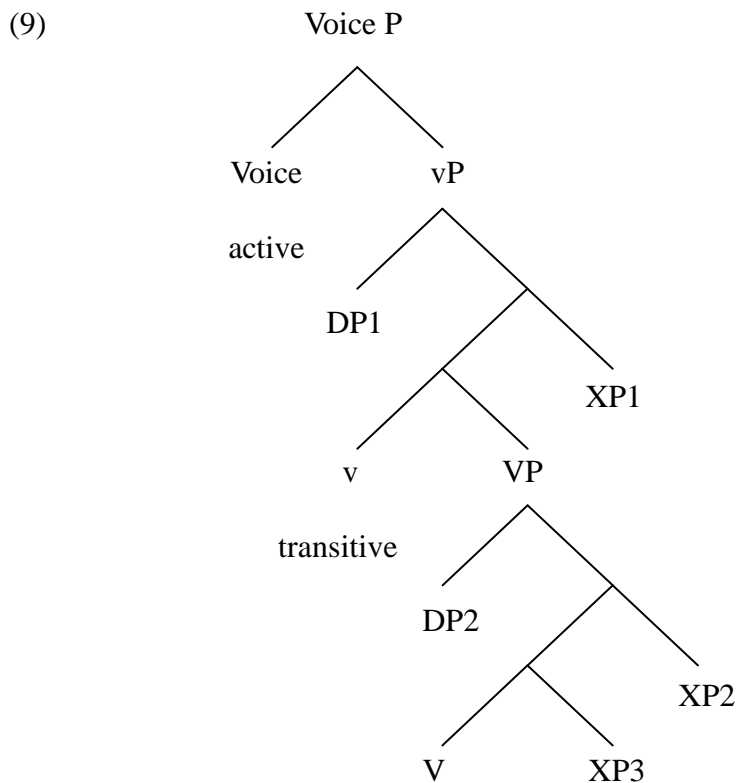
observation suggests that the fact in (6) does not confirm the polysemy of disappearance verbs.

In summary, the facts claimed to confirm the polysemy of disappearance verbs do not prove to support the polysemy-based analysis. If Iwata's claim were correct, many change of state verbs would be polysemous between change of state meaning and motion meaning, but this analysis is nothing but an ad hoc explanation.

The next section shows that the apparent polysemy of disappearance verbs systematically follows from the hierarchical event structure.

3. An Account of Argument Realization Patterns of Disappearance Verbs

Under the system of hierarchical event structure, there are only two relations between two event-denoting elements: the c-command relation, which produces a causal relation, and the mutual c-command relation, from which a further specification relation emerges.



- (10) [[[[V XP3] XP2] XP1] ...]
- a. c-command relation: causality
 - b. mutual c-command relation: identity

The two event structural relations hold of the argument realization options of disappearance verbs as well. In this system, any verb that inherently involves change of state meaning is compatible with a path phrase in principle when the path phrase evokes a causing event that leads to the result event of the verb. In the case of verbs of disappearance, motion meaning follows because the cause of disappearance is under-specified. The under-specification of a cause allows a motion to be the causing event of disappearance. The motion meaning of disappearance verbs is outside the verb's lexical specifications. As a result, we no longer need to assume that disappearance verbs lexicalize motion meaning polysemously.

The remainder of this section provides empirical evidence for the hierarchical event structure account of argument realization options of disappearance verbs. Specifically, I show that the path phrases that can co-occur with verbs of disappearance are XP2 adjuncts.

3.1. Three Types of XPs

First, as indicated in (9), disappearance verbs allow at least three syntactic positions to which event-denoting elements can adjoin. Each XP can be exemplified by the italicized expressions in the following examples.

[XP1]

- (11) John disappeared *by magic*.

[XP2]

- (12) John disappeared *into the room*.

[XP3]

- (13) The magician disappeared *into nothingness*.

The XP1 of disappearance verbs corresponds to instrumental phrases such as *by magic* ((11)). The path phrase *into the room* in (12) can be considered situated in the XP2 position. Both elements are arranged above the verb in the hierarchical event structure, and therefore, their causal interpretations follow. Note that the path phrase in (12) evokes a causing event that leads to John's disappearance. The causal meaning of path phrases that co-occur with disappearance verbs can be confirmed by the following data:

- (14) The witch vanished into the forest.

- (15) a. * The witch went into the forest by vanishing.
b. The witch went into the forest and thereby vanished.

(Goldberg and Jackendoff (2004:541))

The sentences in (15) are meant to be possible paraphrases of sentence (14). The asterisk in (15a) indicates that this sentence is inappropriate as a paraphrase. By contrast, sentence (15b) is licit as a paraphrase, in which the motion of the witch serves as a causing event of the disappearance event expressed by the verb.

The result phrase *into nothingness* is equated with XP3, which is in a non-symmetric relation with the verb. As a result, the phrase can be interpreted as a result event that further specifies the meaning of the verb.

3.2. The Order of XPs

The hierarchy of the three types of XPs can be confirmed by the possible orders of the XPs.

XP1 is hierarchically higher than XP3, so the former has to follow the latter in the linear order. The same is true of the XP order of XP2 and XP3. Consider the following.

[XP1 and XP3]

- (16) a. The magician disappeared into nothingness (XP3) by magic (XP1).
b. ? The magician disappeared by magic (XP1) into nothingness (XP3).

[XP2 and XP3]

- (17) a. The children disappeared into nothingness (XP3) into the forest (XP2).
b. ?? The children disappeared into the forest (XP2) into nothingness (XP3).

In (16), although the contrast in acceptability is very slight, the order in which XP1 follows XP3 is more natural than the opposite order. Likewise, in (17), XP2 has to follow XP3.

3.3. Constituency Tests

The XP2 status of the path phrases that can co-occur with verbs of disappearance is further confirmed by the following constituency tests:

- (18) a. John disappeared into the room like a thief.
b. * What John did into the room was disappear like a thief.
- (19) a. John disappeared into the room.
b. * John wanted to disappear into the room and disappear he did into the room.
- (20) a. Mary will disappear into the room.
b. * Who will disappear into the room? Mary will into the room.

All these constituency tests suggest that the path phrase *into the room* that co-occurs with the

verb *disappear* is included in VP.

3.4. Direct/Indirect Causation

Either XP1 or XP2 can be interpreted as a direct causing event that leads to the result event denoted by disappearance verbs when it occurs immediately above the verb in hierarchical event structure. By contrast, when XP1 and XP2 co-occur in a single clause, in which XP2 intervenes between XP1 and the verb, XP1 evokes an indirect cause of the disappearance event. This direct/indirect causation distinction can be exemplified by the following:

- (21) a. John { disappeared / vanished } into the hole (XP2).
b. John { disappeared / vanished } by magic (XP1).
c. John { disappeared / vanished } into the hole (XP2) by magic (XP1).

In sentence (21a), the XP2 *into the hole* evokes the direct cause of John's disappearance. In (21b), likewise, the XP1 *by magic* directly causes John to disappear or vanish. When the two XPs co-occur, as in (21c), the higher XP serves to evoke an indirect cause of John's disappearance, with the lower XP describing the direct causation. In this way, the distinction between the direct and the indirect causation of disappearance is systematically correlated with the relative hierarchy of XPs.

3.5. Coordination of XPs

Under the system of hierarchical event structure, a cause-evoking expression that is situated immediately above a result-evoking expression in the hierarchical event structure is the direct cause of a result event. When either XP1 or XP2 co-occurs with a result-denoting expression, with no event-denoting expression intervening between them, it evokes the direct cause,

regardless of whether it is XP1 or XP2. In other words, although such XP1s and XP2s occur in distinct syntactic positions, they are semantically equivalent. The presence or absence of the semantic equivalence is sensitive to the possibility of co-ordination.

- (22) a. Did he break the vase against the floor or with a hammer?
b. Did he break the vase with a hammer or against the floor?
- (23) a. ? Did he break the vase into pieces or with a hammer?
b. ? Did he break the vase with a hammer or into pieces?

The co-ordination of XP1 and XP2, which evokes the direct cause of the change of state of the vase, is possible, as in (22). The co-ordination of a cause-evoking expression and a result-evoking expression, by contrast, results in unacceptability, as in (23). Importantly, disappearance verbs allow the co-ordination of the instrumental phrase *by magic* and the path phrase *into the hole*.

- (24) a. Did he {disappear/vanish} by magic or into the hole?
b. Did he {disappear/vanish} into the hole or by magic?

This fact suggests that the path phrase is a cause-evoking expression.

3.6. Entailment of Distance

Under the hierarchical event structure analysis of disappearance verbs, it follows that disappearance verbs are devoid of motion meaning. The absence of motion meaning can be further supported by their incompatibility with interrogative sentences that focus on distance of motion.

- (25) a. How far did the dog go?
 b. How high did the balloon rise?
- (26) a. ?? How far did the dog disappear?
 b. ?? How far did the dog vanish?

The verbs *go* and *rise*, which lexically include motion meaning, can appear in the interrogative sentences that ask about distance of motion, as in (25). The disappearance verbs *disappear* and *vanish*, on the other hand, are incompatible with such interrogatives, as in (26).

3.7. Substitution with *There*

Levin (1977:44) states that a locative PP that evokes a means and a true locative PP can be differentiated by the possibility of substitution with *there*. *There* can be used as an anaphoric form, which refers to a true locative, so it can substitute for the PP in (27) but cannot in (28).

- (27) John put the book *on the table* and Bill put one *there* too.

(Levin (1977:44), with slight modifications)

- (28) a. ?? John squeezed the tennis ball *on the table*, and then, Mary squeezed the rubber ball *there* too.
 b. John squeezed the tennis ball *on the table*, and then, Mary squeezed the rubber ball *on it* too.

The locative PP *on the table* in (27) denotes a pure location on which the book is positioned. The locative PP *on the table* in sentence (28), on the other hand, evokes a means in addition to a pure location because John squeezed the tennis ball by pushing it on the table. Crucially, the locative PP *on the table* in (27) can be considered situated in the syntactic position of XP₃,

which serves to further specify the meaning of the verb. In fact, the PP specifies the goal of motion that is entailed by the verb *put*. By contrast, the locative PP *on the table* in (28) is in the position of XP2, which is higher than V in the hierarchical event structure, showing a causal relation between the PP and V; the event evoked by the PP causes the event of the verb. In this way, the interpretations of locative PPs are determined by their syntactic positions, and the locative PP that evokes a pure location due to its position in XP3 can be substituted for with the anaphoric form *there*, whereas the locative PP that evokes a means due to its position in XP2 cannot.

The restriction on the substitution with *there* holds of path phrases as well. Consider the following contrast in acceptability.

- (29) a. John knows that the forest is suitable for him to hide himself in. So he went there in order to escape from the police.
- b. * John knows that the forest is suitable for him to hide himself in. So he {disappeared/vanished} there in order to escape from the police.

In these examples, the first sentences imply the existence of a path, and the path is expressed with *there* in the second sentences. Note that the motion verb *go* allows *there* to express the path, but the disappearance verbs *disappear* and *vanish* do not. This contrast in acceptability explicitly shows that path phrases that co-occur with disappearance verbs are situated in the XP2 position, evoking a means of disappearance.¹

¹ The factors that determine the possibility of substitution with *there* seem to be more complex. O'Grady (1987:59) observes that the path phrases that co-occur with the manner of motion verbs *run* and *walk* can be substituted for with *there*, but those that co-occur with the verbs *give* and *talk* cannot.

- (i) a. The child ran *to his mother* and Harry ran *there* too.
 b. Sue walked *to the store* and Harry walked *there* too.
- (ii) a. * Sue gave a book *to John* and I gave one *there* too.
 b. * Sue talked *to John* and Harry talked *there* too.

3.8. The Direct Cause Interpretation

There exists a restriction concerning the interpretation of a cause-evoking expression. A cause-evoking expression must be interpreted as a direct cause when no other cause-evoking expression intervenes between it and the result-evoking expression. This restriction is exemplified by the following data:

- (30) (Situation: John hit the ball with a bat, and the ball shattered the vase.)
- a. John shattered the vase with a ball.
 - b. # John shattered the vase with a bat.

According to the context in (30), a ball, not a bat, is the direct cause of shattering the vase. In sentence (30a), no cause-evoking expression intervenes between the verb *shatter* and the PP *with a ball*. As a result, the PP is interpreted as the direct cause. On the other hand, sentence (30b), whose syntactic structure requires that the PP be interpreted as a direct cause, is unacceptable because of the contradiction between the context and the interpretation imposed by the syntax.

This restriction on the interpretation of a cause-evoking PP holds of path phrases that co-occur with disappearance verbs. Observe the following:

- (31) (Situation: John walked past the tree into the building, where he disappeared from view.)

(O'Grady (1987:59), the italics in (11a) and (12a) are mine)

Assuming that the verbs *run* and *walk* inherently include a path, the possibility of substitution of a path phrase with *there* in (i) can be accounted for in a parallel fashion with the explanation presented here. The verbs *give* and *talk* seem to lexically include a path as well, so the path phrase *to John* can be considered to occur in the XP3 position. The verb *give* entails a change of possession of an object, and *talk* entails a motion of the contents of speech. In this case, however, the substitution using *there* is not possible. The unacceptability of the sentences in (ii) seems to follow because the lexical meaning of the anaphoric form *there* is incompatible with a non-pure path interpretation.

- a. John disappeared into the building.
- b. # John disappeared past the tree.

In the context in (31), John became invisible when he went into the building, but not when he passed the tree. Sentence (31a) is licit because the context and the interpretation of the path phrase imposed by the syntax are compatible. Sentence (31b), on the other hand, is illicit because there exists a contradiction between the context and the interpretation of the path phrase.

4. Concluding Remarks

This chapter has shown that the system of hierarchical event structure gives a straightforward account of the argument realization options of disappearance verbs. This account allows us to simplify the lexical entry of disappearance verbs. Although they apparently show two meanings, namely, disappearance meaning and motion meaning, I have argued that the former is the lexical meaning of disappearance verbs, and the latter follows from the under-specification of their cause. All the facts observed in section 3 point to this conclusion.

Appendix: *Through* PPs with Verbs of Disappearance

In this chapter, I have argued that path phrases such as *into the room* that co-occur with verbs of disappearance are associated with the XP2 position. In addition to such PPs, path phrases headed by *through* are also compatible with the verbs. Observe the following sentences:

- (1) a. John disappeared into the room.
- b. John disappeared through the window.

The two types of path phrases serve to denote the means of disappearance, as exemplified by

the following paraphrases:

- (2) a. John disappeared into the room.
b. = John disappeared by going into the room.
- (3) a. John disappeared through the window.
b. = John disappeared by going through the window.

Furthermore, the two types of path phrases are compatible in a single clause, and their order is changeable:

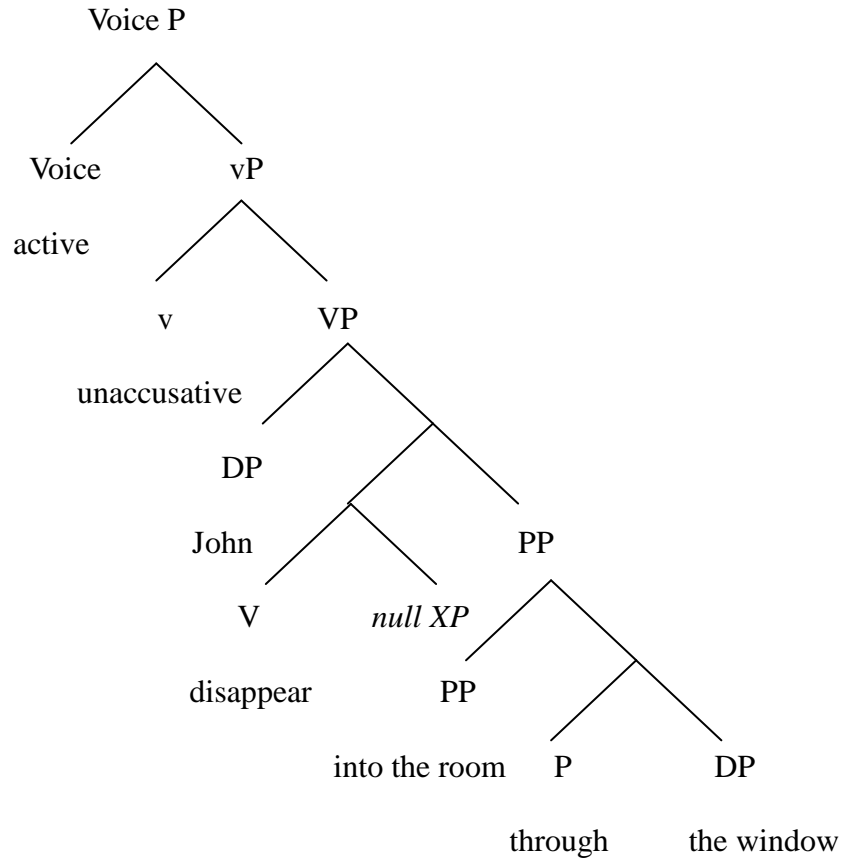
- (4) a. John disappeared into the room through the window.
b. John disappeared through the window into the room.

When a manner adverbial such as *like a thief* intervenes between them, however, only the order in which an *into* phrase precedes a *through* phrase is allowed:

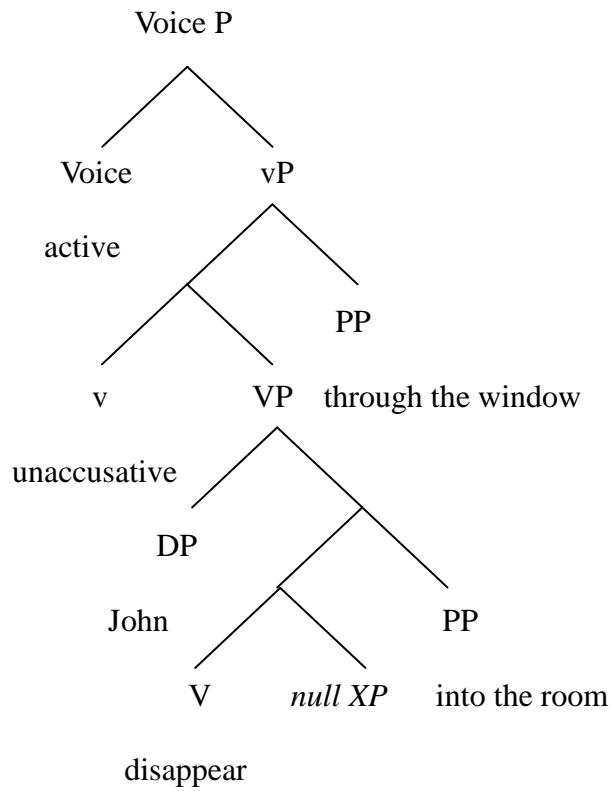
- (5) a. John disappeared into the room through the window.
b. John disappeared into the room like a thief through the window.
- (6) a. John disappeared through the window into the room.
b. * John disappeared through the window like a thief into the room.

Assuming that the manner adverbial *like a thief* is adjoined to the maximal projection of V, *through* phrases have two adjunction sites (see also chapter 8).

(7)



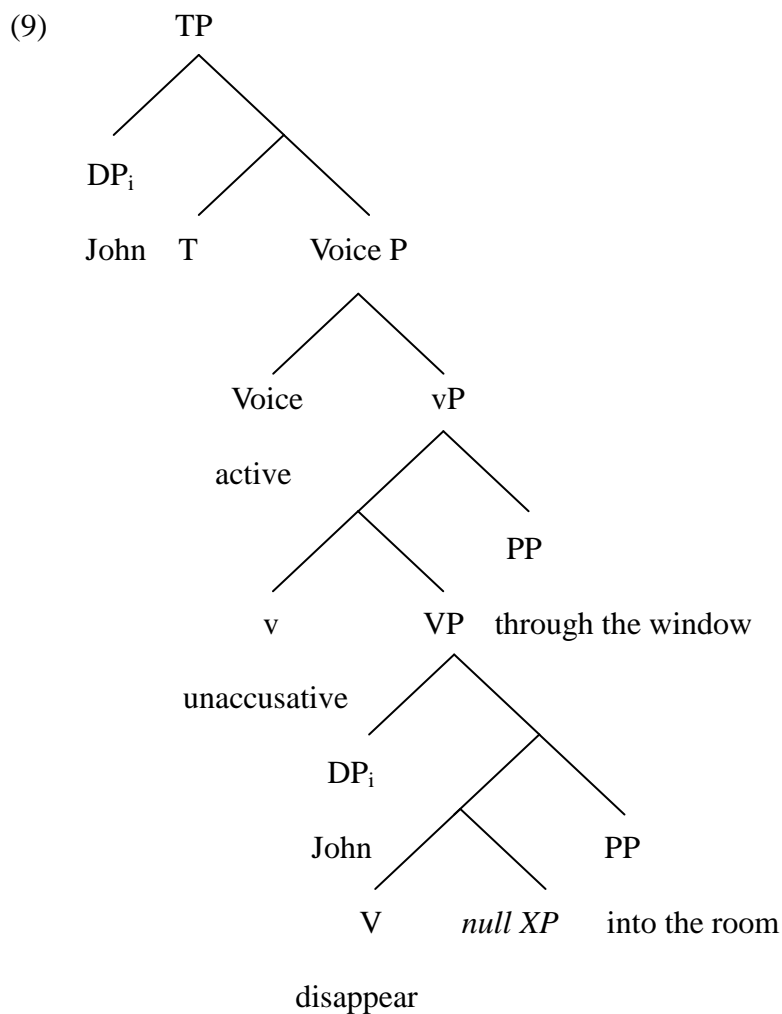
(8)



When the *through* phrase in (4) is generated in VP, it forms a constituent with the *into* phrase,

as in (7). When the *through* phrase is adjoined to vP, on the other hand, it does not form a constituent with the *into* phrase, and the structure in (8) results.

Note that, even in (5b), the internal argument *John* is in a predicational relation with both the *into* phrase and the *through* phrase. The syntactic relation of c-command between the internal argument and the *through* phrase naturally obtains in the following structure:



Assuming the copy theory (Chomsky (1995)), it follows that the copy of the internal argument *John* in the specifier position of TP c-commands the *through* phrase, so the *through* phrase can be predicated of *John*.

The analysis in (8) can be supported by the following constituency test.

- (10) John disappeared into the house through the window, and Mary did so through the back door.

This sentence shows that the pro-form *did so* can replace the constituent *disappeared into the house*, leaving behind the *through P*. This fact naturally follows because the *through P* is adjoined to the XP1 position, which is outside the scope of the pro-form *did so*.

In the next chapter, we will see that the analysis of *through* phrases that occur with disappearance verbs holds of verbs that occur with change of location verbs such as *go*.

Chapter 8

Syntactic and Semantic Parallelisms between Prepositional Phrases Denoting Paths and Instruments

1. Introduction

Generally, motion verbs are compatible with path phrases. The verb *go*, for example, can be followed by the following two types of path phrases, as shown in (1):

- (1) a. John went into the room through the window.
b. John went through the window into the room.

In the sentences above, the PP *into the room* denotes Goal, and *through the window* refers to a path that leads to the goal place. The sentences in (1) show that the order of these two types of path phrases can be reversed.¹

When the PP *like a thief* intervenes between the two path phrases, however, a difference in grammaticality emerges between the two sentences. Observe the following:

- (2) a. John went into the room like a thief through the window.
b. * John went through the window like a thief into the room.

In sentence (2a), where the *into* phrase precedes the *through* phrase, the expression *like a thief* can occur between them. Sentence (2b), on the other hand, shows that the opposite

¹ In this thesis, I do not take into account of a shade of difference in meaning between sentences (1a) and (1b).

order of the two path phrases disallows the intervention of this expression between the two PPs.² This contrast suggests that we need to distinguish the two types of path phrases in syntactic terms.

The syntactic properties of path phrases that co-occur with motion verbs have been widely discussed or investigated by many researchers (cf. Gruber (1965), Folli and Harley (2006), Nam (2004), etc). To the best of my knowledge, however, there is no exploration into the syntactic difference between *through* phrases and *into* phrases, as in (2).

In this chapter, I argue that certain syntactic and semantic properties of the two types of path phrases, namely, *into* phrases and *through* phrases, follow from the system of hierarchical event structure. It is shown that there is a syntactic and semantic asymmetry between *into* phrases and *through* phrases that co-occur with the motion verb *go*. In syntactic terms, an *into* phrase obligatorily forms a constituent with a *through* phrase when the *into* phrase follows the *through* phrase, whereas a *through* phrase does not necessarily form a constituent with an *into* phrase when the *through* phrase follows the *into* phrase. In semantic terms, the *through* phrases, not the *into* phrases, can function as a means for going somewhere (and make it possible for someone to go there). These syntactic properties are summarized as follows:

- (3) a. When a *through* phrase follows an *into* phrase in a single clause, the *through* phrase may or may not form a constituent with the *into* phrase, and it denotes a path for someone to go to the goal place of the *into* phrase.
- b. When an *into* phrase follows a *through* phrase in a single clause, the *into* phrase obligatorily forms a constituent with the *through* phrase, and it denotes

² Sentence (2b) is acceptable when a comma or pause is put between the expression *like a thief* and the PP *into the room*, as shown below:

- (i) John went through the window like a thief, into the room.

a goal place.

The organization of this chapter is as follows. Section 2 surveys previous studies that address a syntactic restriction on the licit order of more than one PP when they co-occur in a single clause. Based on these studies, section 3 argues that *through* phrases can be distinguished from *into* phrases in their syntactic properties, and it proposes that this syntactic distinction between *through* phrases and *into* phrases corresponds to a semantic difference between them. Section 4 argues that the syntactic property of *through* and *from* phrases is shared with PPs that denote means of change of state. Section 5 suggests that the same type of semantic and syntactic asymmetry can be observed between *through* phrases and *to* phrases in subjective motion expressions. Section 6 offers concluding remarks.

2. Previous Studies

Under certain circumstances, the order of locative or path PPs could affect the grammaticality of the sentences (cf. Gruber (1965), Quirk and Greenbaum (1973), Schütze (1999), Huddleston and Pullum (2002), Nam (2004), Folli and Harley (2006), Randall (2010), to name a few). The following contrast illustrates the possibility that the intervention of the locative PP *at the party* between the verb and the path PP *around the bathroom* is not allowed (Folli and Harley (2006:133)):

- (4) a. Sue danced around the bathroom at the party.
b. # Sue danced at the party around the bathroom.

In the sentences, the PPs *around the bathroom* and *at the party* are syntactically distinct. The former designates the path of motion that Sue follows and is associated with a VP

internal position. The latter, on the other hand, describes a place in which the event *Sue danced around the bathroom* occurred. Therefore, the PP is associated with a VP external position. As a result, the occurrence of the VP external element within the VP results in ungrammaticality.

Similar effects can be observed in the following sentences:

- (5) a. John jumped off of the train in New York.
b. The model electric trains went along their tracks about the room, and finally rammmed into each other at the corner.
- (6) a. * John jumped in New York off of the train.
b. * The model electric trains finally rammmed at the corner into each other.

(Gruber (1965:90))

In the sentences in (5), the first PPs refer to the motion of the referents of the subject NPs, and the second PPs locate the events. Gruber (1965:90) states that the sentences in (6) must be spoken with a pause between the two PPs, if possible at all. This statement is noteworthy because sentence (2b), which we have observed in section 1, also requires a pause (or a comma) before the *through* phrase (see footnote 2).

In this way, a syntactic restriction on the licit order of a locative PP and a path PP has been widely discussed in the literature. To the best of my knowledge, however, there is no study that investigates a syntactic restriction on the licit order of *through* phrases and *into* phrases when they co-occur with the verb *go*. Although none of the studies we have mentioned above explore this matter, they are noteworthy in that they account for the licit order of a locative PP and a path PP occurring in a single clause on the basis of syntactic properties involved in the PPs.

Jackendoff (1973) gives a syntactic analysis of the co-occurrence of two distinct path PPs. Observe the following:

- (7) a. A Martian grzch limbered down the street toward the frightened garbage collector.
b. The mice raced from one end of the park to the other.
c. Max sent the trilogy to Bill in New York.

(Jackendoff (1973:351))

The two PPs form a constituent in each sentence, which is confirmed by the following data:

- (8) a. Down the street toward the frightened garbage collector lumbered a Martian grzch.
b. From one end of the park to the other raced the mice.
c. To Bill in New York, Max sent the trilogy.

(Jackendoff (1973:351-352))

In each sentence, two PPs are preposed to the leftmost position of a sentence, indicating that they form a constituent.³

Jackendoff (1973) states that the sentences in (7) do not necessarily have the same

³ When two PPs in a single clause do not form a constituent, they cannot be preposed to the leftmost position of a sentence. For example, observe the following:

- (i) a. Harpo paraded down the aisle with Margaret Dumont.
b. Down the aisle paraded Harpo with Margaret Dumont.
c. ?* Down the aisle with Margaret Dumont paraded Harpo.

(Jackendoff (1973:352))

The PP *down the aisle* is a path phrase, whereas the PP *with Margaret Dumont* is comitative. Although either of the two PPs can be moved to the leftmost position, as shown in (ib), both cannot be preposed to this position simultaneously, as in (ic).

syntactic property. He notes that, although manner adverbs such as *noisily* can be interposed between the two PPs in sentence (7a), they cannot in sentences (7b) and (7c), as illustrated below:

- (9) a. A fearsome grzch lumbered down the street *noisily*(,) toward the frightened garbage collector.
- b. * The mice raced from one end of the park *rapidly*(,) to the other.
- c. * Max sent the trilogy to Bill *quickly* (,) in New York.

On the basis of the syntactic contrast, he argues that sentence (7a) is ambiguous between the following two structures:

- (10) a. [VP V [PP P NP PP]]
- b. [VP V [PP P NP][PP P NP]]

(Jackendoff (1973:351))

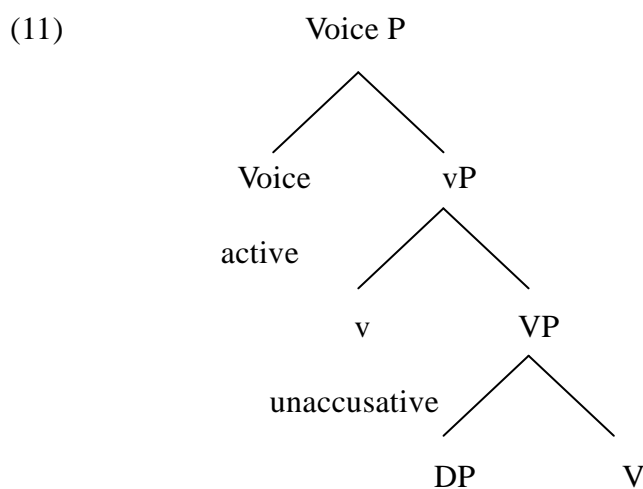
Sentence (8a), in which the two PPs form a constituent, includes the structure in (10a), whereas sentence (9a), in which the two PPs are split by a manner adverb, has the structure in (10b). Sentences (7b) and (7c), on the other hand, only have the structure in (10a) because the two PPs do not allow the intervention of a manner adverb between them, as shown in (9b) and (9c), respectively.

In this way, Jackendoff (1973) offers a syntactic analysis of the contrast between sentence (9a) and the sentences in (9b, c) on the basis of the syntactic structures in (10). Although Jackendoff's approach is different from the system of hierarchical event structure, the division of two types of path phrases based on the distinct syntactic structures in (10) is

in agreement with my system.

3. The Syntax of Path Phrases

In this section, I propose the hierarchical event structure analysis of the two types of path phrases, namely, *through* phrases and *into* phrases, that co-occur with the verb *go*. I assume that the verb *go* occurs in the structure of v-unaccusative, as shown below:⁴

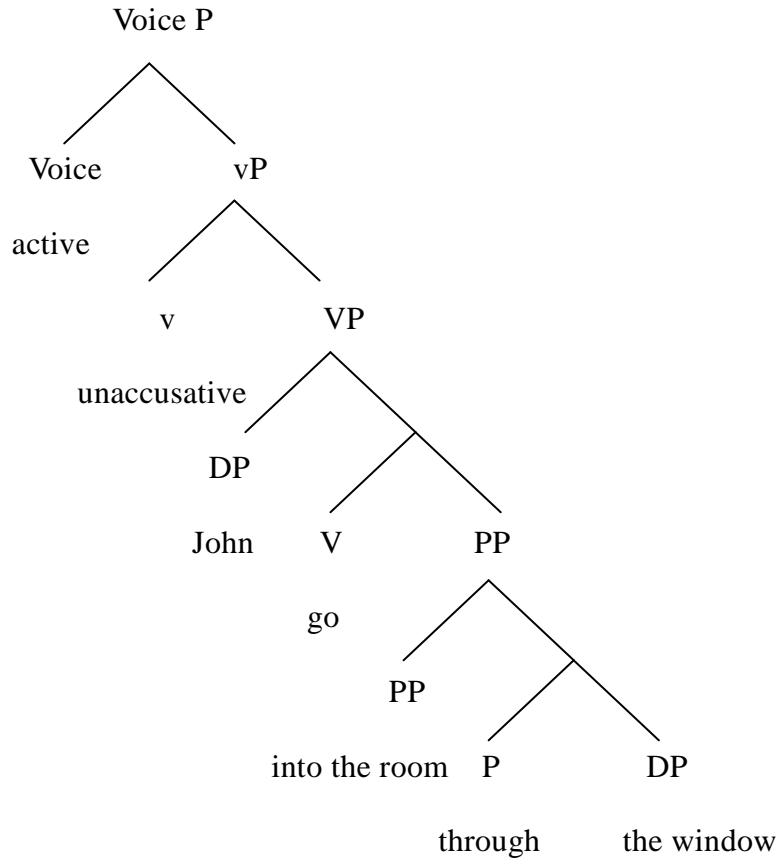


I propose that *through* phrases can be associated with either the XP1 position or the XP3 position, whereas *into* phrases are associated only with the XP3 position. Under this analysis, the *through* phrases obligatorily form a constituent with the *into* phrases when both appear in the XP3 position ((12)). When the *through* phrases occur in the XP1 position, on the other hand, the *through* phrases and the *into* phrases are syntactically separated ((13)).

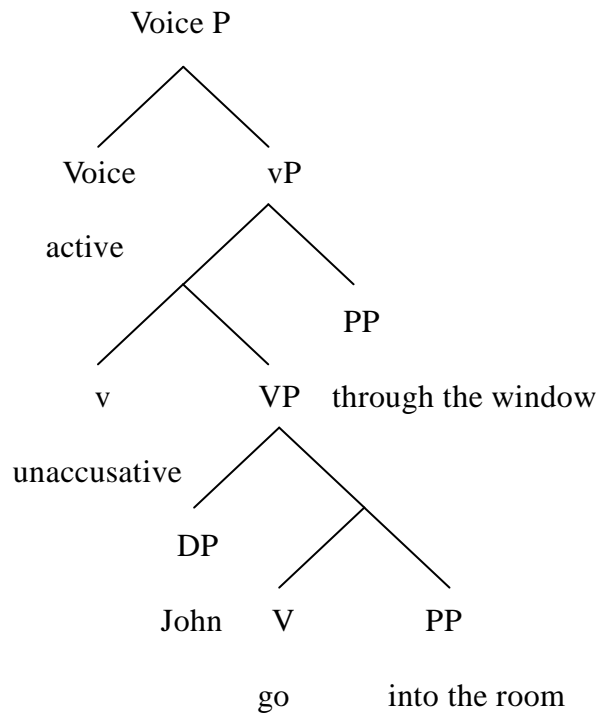
(11) John went into the room through the window.

⁴ Levin and Rappaport (1995) argue that verbs of inherently directed motion, including *go* and *come*, can be characterized as unaccusative verbs.

(12)



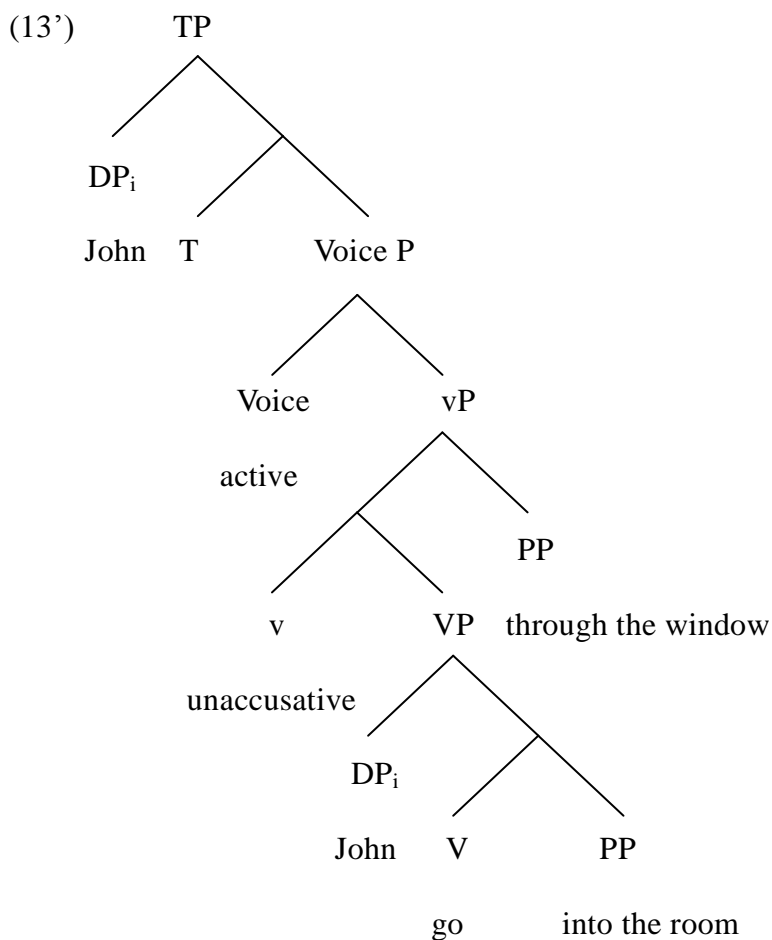
(13)



Under the system of hierarchical event structure, the syntactic dual properties exhibited by *through* phrases are directly associated with the dual semantic properties of means and path.

In the structure in (13), the *through* phrase is in a c-command relation with the *into* phrase. This syntactic relation evokes a causal relation between them, in which the *through* phrase serves to evoke means that cause the result event: John went into the room by going through the window. At the same time because the *through* phrase entails a path, it is also compatible with the XP3 position, in which it further specifies the motion of the verb *go*. That is, for *through the window* in (11), the two interpretations of path and means are two sides of the same coin.

Note that in (13) the internal argument is in a predicational relation with both the *into* phrase and the *through* phrase, although it appears that the internal argument does not c-command the latter. In my analysis, the syntactic relation of c-command between the internal argument and the *through* phrase naturally obtains in the following structure:



In this tree, the copy of the internal argument that is merged to the specifier position of TP c-commands the *through* phrase.

In the remainder of this section, we observe several syntactic and semantic characteristics concerning the two types of path phrases I have mentioned here. I show that all these characteristics naturally come from the system of hierarchical event structure.

3.1. The Syntax of Path Phrases

In this subsection, I show that there exists five syntactic differences between *through* phrases and *into* phrases, and I argue that all of the differences arise from their distinct syntactic properties.

3.1.1. The Order of Constituents

First, it is predicted that there is a linear order restriction on *through* phrases and *into* phrases because they appear in distinct syntactic positions in (13). Note that the possibility that the *through* phrases and *into* phrases form a constituent, as in (12), can be excluded by the intervention of a manner adverbial between them. The following data verify this prediction:

(14) a. John went into the room like a thief through the window.

b. * John went through the window like a thief into the room.

(= (3))

The contrast in grammaticality between (14a) and (14b) is in accordance with the analysis in (13).

3.1.2. Constituency Tests

Constituency tests also verify my analysis. It is predicted that the *do so* substitution can strand *through* phrases but not *into* phrases because only the former can be associated with the XP1 position. This prediction is confirmed by the following contrast:

- (15) a. ?? John went through the window into the kitchen, and Mary did so into the living room.
- b. John went into the room through the window, and then Mary did so through the door.

The *through* phrase in (15b) can be stranded by the *do so* substitution, but the *into* phrase in (15a) cannot.⁵

Likewise, we can predict that the syntactic operation using pseudo cleft sentences also points to the validity of my analysis. In fact, the following data verify this prediction:

- (16) a. He went into the room through the window.
= a'. What he did through the window was go into the room.
b. He went through the window into the room.
≠ b'.* What he did into the room was go through the window.

The original sentences of those in (16a') and (16b') are (16a) and (16b), respectively. The *through* phrase can follow the pro-form *did* in sentence (16a'), but the *into* phrase cannot in sentence (16b'), explicitly showing their syntactic asymmetry.

⁵ A similar observation is made in Huddleston and Pullum (2002:684):

(i) * Kim went to London and Pat did so to NY.

The *do so* substitution and pseudo cleft sentences show that the *into* phrases and *through* phrases occurring with the verb *go* can be distinguished in syntactic terms. When a *through* phrase follows an *into* phrase in a single clause, the *through* phrase can be in the XP1 position, and it does not have to form a constituent with the *into* phrase. When an *into* phrase follows a *through* phrase, on the other hand, the *into* phrase is still associated with the XP3 position, and it obligatorily forms a constituent with the *through* phrase.

Furthermore, the PP *through the window* cannot follow a purpose adverbial. Guéron (2005) observes that a purpose adverbial is adjoined to TP. The contrast in the following sentences indicates that the *through* phrase is adjoined below TP.

- (17) a. John went into the house through the back door so that she would not notice him.
- b. * John went into the house so that she would not notice him through the back door.

The contrast in acceptability follows because the *through* phrase can be adjoined to vP, but not to TP. This fact is in conformity with my analysis that the *through* phrase can be associated with either vP or VP.

3.1.3. Modification by *Again*

Third, the PP *through the window* takes wide scope over *again* when the former follows the latter, and vice versa.

- (18) a. John went into the house again through the window. (again < through P)
- b. John went into the house through the window again. (through P < again)

In sentence (18a), the event of going into the house was repeated twice (e.g., John went into the house through the back door. He got out of there. Finally, he went there through the window.). In sentence (18b), on the other hand, the event of going into the house through the window was repeated twice (e.g., John went into the house through the window. He got out of there. Finally, he went there through it.). This contrast follows because the *through* phrase is outside the scope of the adverb *again* in (18a), whereas in (18b) the former is inside the scope of the latter.

3.1.4. Extraction of a Constituent

Fourth, it is possible to extract either *through the window* or *into the room* in (19).

- (19) a. It was into the room that John went through the window.
b. It was through the window that John went into the room.

This fact suggests that the two PPs do not necessarily form a constituent.

3.1.5. Extraction of an NP from a Constituent

Finally, the extraction of an NP from a sequence consisting of *into the room* and *through the window* is possible only when the latter follows the former and they do not form a constituent.

- (20) a. Where did John go into ___ through the window?
b. ?? Where did John go through ___ into the room?

When the *through* phrase precedes the *into* phrase, they must form a constituent. The unacceptability of (20b) follows because an NP is extracted from a constituent that consists of two PPs. Inoue (1999) observes that the extraction of an NP from a constituent that is composed of two PPs is prohibited.

- (21) a. John sent the book to New York to Bill.
b. The duck swam from the shore from the tree.

(Gruber (1976:85))

- (22) a. * Where did John send the book to to Bill?
b. * Who did John send the book to New York to?

- (23) a. * Where did the duck swim from from the tree?
b. * Where did the duck swim from the shore from?

(Inoue (1999:147))

The data in (22-23) show that an NP cannot be extracted when it is a part of a constituent composed of two PPs.

In (20a), on the other hand, the *through* phrase does not necessarily form a constituent with the preceding PP. This sentence is licit because the extracted NP is not part of a constituent composed of two PPs.

To summarize, the data we have observed here point to the analysis in (12-13).

3.2. A Semantic Property of Adjunct Paths

In the previous subsection, we have observed a syntactic difference between *through* phrases and *into* phrases. In this subsection, I argue that this syntactic difference between them corresponds to a semantic difference: *into* phrases refer to a goal place (a path),

whereas *through* phrases denote a path for us to go to the goal place (a path and a means).

This semantic difference between the two types of path phrases can be made explicit by using *how* questions. Interrogatives with *how* can elicit means or instrument adjuncts (cf. Quirk et al. (1985:558), Konishi (1989:916)), as shown below:

- (24) a. How did you get in? By climbing through the kitchen window.
b. How is she going to pay for it? By cheque.
c. How can I remove it? With a razor-blade.

(Huddleston and Pullum (2002:908), with slight modifications)

In the case of path phrases, a *through* phrase can serve as an appropriate answer to a *how* interrogative, whereas an *into* phrase cannot, as shown below:

- (25) a. How did John go into the room? Through the window.
b. * How did John go through the window? Into the room.

The contrast between (25a) and (25b) shows that the PP *through the window* can refer to a means of John's going into the room, but the PP *into the room* cannot. In other words, the path expressed by *through the window* in example (25a) serves as a means because it is a path for John to go into the room. In sentence (25b), on the other hand, the room cannot be considered a means of the motion through the window, so it does not function as a path for John to go through the window.

The semantic difference between *through* phrases and *into* phrases can be further confirmed by the paraphrases using *by* and *by way of*, which make explicit that the NPs following them express a means (cf. Konishi (1976) and Jackendoff (1990:95)):

(26) a. John went into the room through the window.

= b. John went into the room by the window.

(27) a. John went through the window into the room.

≠ b. * John went through the window by the room.

As shown in the examples above, sentence (26a) can be paraphrased into (26b), but sentence (27b) is illicit as the paraphrase of (27a).

The same is true of the following examples:

(28) a. John went into the room through the window.

= b. John went into the room by way of the window.

(29) a. John went through the window into the room.

≠ b. * John went through the window by way of the room.

In sentences (28b) and (29b), the PPs *through the window* and *into the room* are paraphrased using *by way of*. In this case, too, the PP *by way of the window* serves as the licit paraphrase of *through the window*, whereas *by way of the room* is illicit as the paraphrase of *into the room*.⁶

In summary, this section has argued that there are syntactic and semantic asymmetries between *through* phrases and *into* phrases that naturally follow from the

⁶ A similar contrast between *through* phrases and *into* phrases can be observed in the following examples:

(i) a. John went into the room through the window.

= b. John went into the room by going through the window.

(ii) a. John went through the window into the room.

≠ b. * John went through the window by going into the room.

Sentences (ia) can be paraphrased into (ib), where the PP *through the window* is subordinated to the sentence *John went into the room* by supplementing *by going*, whereas it is illicit to subordinate the PP *into the room* to the sentence *John went through the window*, as shown in (ii).

system of hierarchical event structure.

4. Syntactic Properties of Instrumental Phrases

In the previous sections, we observed that *through* phrases that co-occur with the verb *go* can be associated with the XP1 position and that they can evoke the means of the motion expressed by the verb. In this section, I argue that these syntactic and semantic properties of *through* phrases are shared with instrumental phrases that evoke the cause of the change of state. The following sentences show that the PPs occurring with the change of state verb *break* work as a means for the events of the VPs in the same way as the *through* phrase occurring with the motion verb *go*:

- (30) a. This is the window for John to go into the room.
(cf. John went into the room through the window.)
- b. This is the hammer for John to break the vase.
(cf. John broke the vase with the hammer.)

NPs that can be construed as the means of an action denoted by VPs are compatible with the syntactic frame *this is the NP for someone to VP*.⁷ The data in (30) show that instrumental phrases and *through* phrases can be construed as the means of the events denoted by the verbs.

⁷ When the NPs denoting Goal occur in the NP position of this syntactic frame, the sentences including them are unacceptable, as shown below:

- (i) * This is the room for John to go through the window.
(cf. John went into the room through the window.)
- (ii) * This is the room for John to go from the window.
(cf. John went into the room from the window.)

In these sentences, the NP *the room* does not refer to a means of motion through or from the window, and therefore, it is incompatible with this syntactic frame.

This semantic parallelism between these PPs leads us to predict that they also share the same syntactic properties of XP1 adjuncts. This prediction is confirmed by the following three pieces of evidence.

First, reversing the order of instrumental PPs and result phrases can affect the grammaticality of the sentences including them, in parallel with the cases of *through* phrases and *into* phrases:

- (31) a. John went into the room like a thief through the window.
b. * John went through the window like a thief into the room.
(= (14))
- (32) a. John broke the vase into pieces with a hammer.
b. * John broke the vase with a hammer into pieces.

The ungrammaticality of sentence (32b) follows because the instrumental phrase *with a hammer* intervenes between the verb *break* and the result phrase *into pieces*.⁸

Second, like *through* phrases that are associated with the XP1 position, instrumental phrases can be left behind by the *do so* replacement, as illustrated by the following:

- (33) a. ?? John went through the window into the kitchen, and Mary did so into the living room.
(= (15a))
b. John went into the room through the window, and then Mary did so through the door.
(= (15b))
- (34) a. * John said he would break the vase into pieces, but instead he did so into a thousand pieces.

⁸ For the data in (32), (34) and (36), see also the discussion of the verb *break* in Chapter 2.

- b. John said he would break the vase with a hammer, but instead he did so with a bat.

In the sentences in (33b) and (34b), the path phrase *through the door* and the instrumental PP *with a bat* can be excluded from the scope of *do so*. The path phrase *into the living room* and the instrumental PP *into a thousand pieces* in the sentences in (33a) and (34a), on the other hand, cannot be left behind by the *do so* replacement because they are associated with the XP3 position.

Finally, the syntactic operation using pseudo cleft sentences also points to the same syntactic properties of *through* phrases and instrumental phrases.

- (35) a. What he did through the window was go into the room. (= (16b))
b. * What he did into the room was go through the window. (= (16c))
- (36) a. What he did with a hammer was break the vase into pieces.
b. * What he did into pieces was break the vase with a hammer.

In the same way as the path phrase *through the window*, the instrumental phrase *with a hammer* can follow the pro-form *did*; the *into* phrase and the result phrase cannot be left behind the scope of *did*.

In this section, I have argued that *through* phrases and instrumental phrases share the same semantic and syntactic properties. This finding sheds new light on the parallelism between the change of location domain and the change of state domain from a new perspective.

6. Conclusion

In this chapter, I have shown that the syntactic and semantic differences between *through* phrases and *into* phrases naturally follow from the system of hierarchical event structure. I have argued that *through* phrases can be associated with either the XP1 position or the XP3 position and that the syntactic variations correspond to their semantic properties: the *through* phrases evoke the means of motion. This causal interpretation is in accordance with the XP1 status of the *through* phrases. What is noteworthy is that this correspondence between syntax and semantics is not restricted to motion expressions. We have observed that instrumental phrases that denote the means of change of state are also associated with the XP1 position and that they evoke causal interpretations.

Appendix: *From* Phrases Denoting Means of Motion

In this chapter, I have restricted myself to the comparison of *through* phrases and *into* phrases and argued that *through* phrases can be associated with either the XP1 or XP3 position and express means of an event denoted by the V. In this appendix, I show that *from* phrases also share the same syntactic and semantic properties with *through* phrases.

Like the preposition *through*, the preposition *from* can precede an NP such as *the window*, as shown below:

- (1) a. John went into the room from the window.
b. John went from the window into the room.

The PP *from the window* above refers to a place through which *John* went into the room. In this case, too, the order of the two PPs *from the window* and *into the room* can be reversed.

Crucially, an intervention of *like a thief* between the two PPs affects the

grammaticality of sentence (1b). For example, observe the following:

- (2) a. John went into the room like a thief from the window.
b. * John went from the window like a thief into the room.

As shown in sentence (2a), when the PP *into the room* precedes the PP *from the window*, the intervention of *like a thief* between them is licit. In sentence (2b), on the other hand, where the PP *from the window* precedes the PP *into the room*, the two PPs cannot be separated by *like a thief*.⁹

The restriction on the appropriate order of the two path phrases in (2) leads us to predict that there is a syntactic difference between the two PPs *from the window* and *into the room*. This prediction can be verified by the following two syntactic tests.

First, let us consider the *do so* substitution test:

- (3) John went into the room through the window, and then Mary did so from the door.

As shown in sentence (3), the PP *from the door* need not be included as part of the sequence being replaced by *do so*. The pseudo cleft sentences below also show the same contrast in grammaticality:

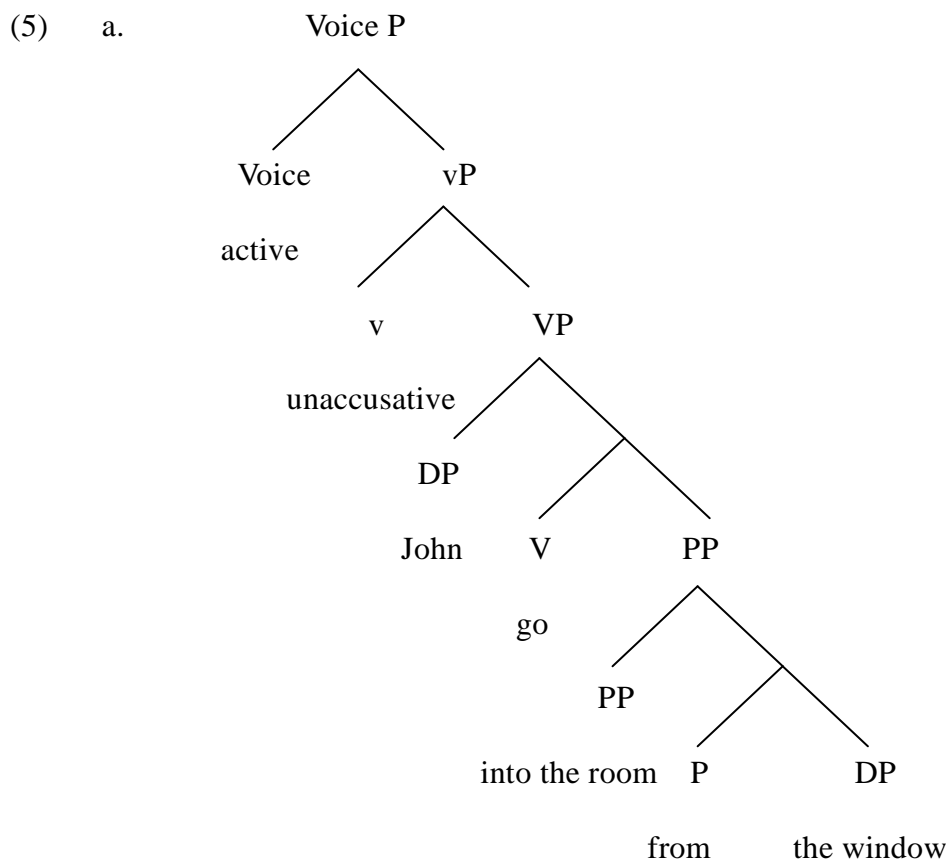
- (4) a. He went into the room from the window.

⁹ Sentence (2b) is grammatical when the phrase *like a thief* and the PP *from the room* are separated by a comma intonation, or at least we have to put a pause between them. Thus, the following sentence with a comma is licit (see also footnote 2):

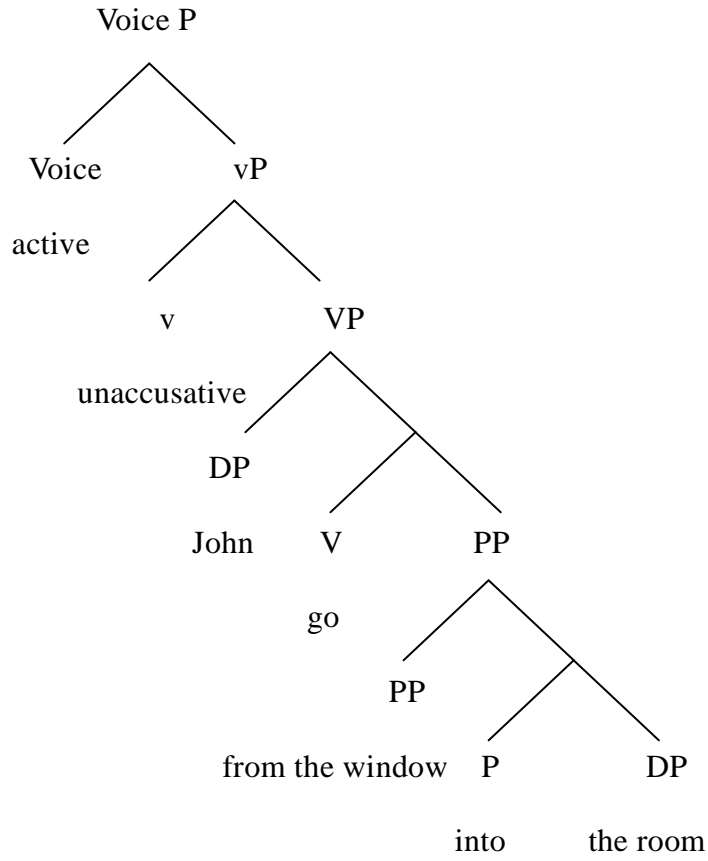
- (i) John went from the window like a thief, into the room.

- = a'. What he did from the window was go into the room.
- b. He went from the window into the room.
- ≠ b'.* What he did into the room was go from the window.

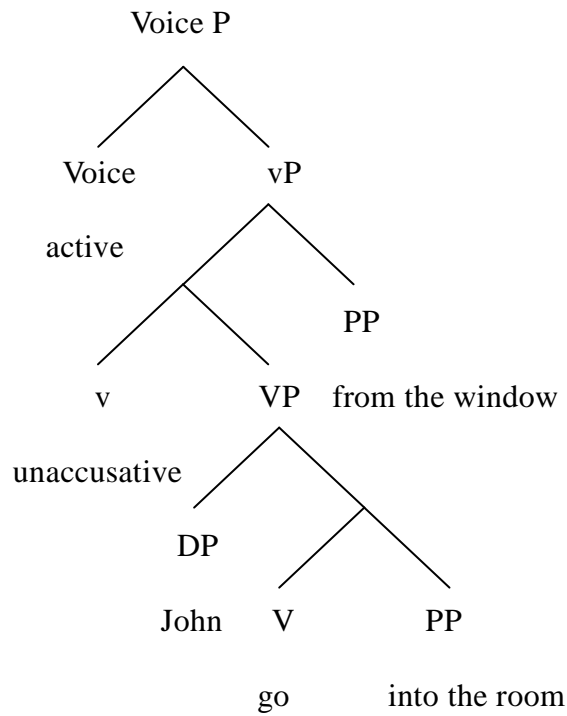
The original sentences of (4a') and (4b') are sentences (4a) and (4b), respectively. Although the PP *from the window* can be combined with the pro-form *did* in (4a'), the PP *into the room* cannot in (4b'). Both constituency tests show that the *from* phrase can be associated with vP as well as VP. Based on these constituency tests, the syntactic structures of the VPs in sentences (1a) and (1b) can be represented in the following way:



b.



(6)



When the *from* phrase precedes the *into* phrase, they must form a constituent, as in (5b), but not vice versa, as in (5a) and (6).

This syntactic difference between the *from* phrase and the *into* phrase corresponds to a semantic difference: the latter refers to a goal place, whereas the former denotes a path for someone to go to the goal place expressed by the *into* phrase. This semantic difference can be confirmed by the following *how* interrogatives:

- (7) a. How did John go into the room? From the window.
b. * How did John go from the window? Into the room.

Although the *from* phrase can be an appropriate answer in (7a), the *into* phrase cannot in (7b). The fact that the PP *into the room* cannot be a licit answer to the *how* interrogative in (7b) shows that this PP does not denote a path for *John* to go from the window; rather, the PP *from the window* expresses a path for *John* to go into the room.

This contrast in acceptability between the two types of path phrases in (7) comes from a semantic difference between the referents of the NPs in these path phrases. That is, *the window* refers to an opening for someone to go into a room, but *the room* does not refer to a path for someone to go from the window.

The contrast below provides evidence for this semantic difference between the two types of PPs:

- (8) a. John went into the room from the window.
= b. John went into the room by the window.
(9) a. John went from the window into the room.
≠ b. * John went from the window by the room.

Sentences (8a) and (9a) are paraphrased into (8b) and (9b), respectively, by using the

preposition *by*, which makes it explicit that the NPs following it denote a means for an action of the VPs. The NP *the window* can follow *by*, as shown in (8b), whereas the NP *the room* cannot, as in (9b).¹⁰

The same contrast can be observed in the following examples using *by way of*:

- (10) a. John went into the room from the window.
= b. John went into the room by way of the window.
- (11) a. John went from the window into the room.
≠ b. * John went from the window by way of the room.

Although the path phrase *from the window* can be paraphrased into *by way of the window*, as illustrated in (10), the PP *by way of the room* is inappropriate as the paraphrase of the PP *into the room*, as in (11). The unacceptability of (9b) and (11b) follows from the fact that *the room* cannot be construed as a means for *John's* going from the window.

In this appendix, I have argued that the PP *from the window* in *John went into the room from the window* can serve as an adjunct, and this PP refers to a path for *John* to go into the room. In this respect, the *from* phrase behaves in the same way as *through* phrases.¹¹

¹⁰ Sentence (8a) can be paraphrased into (ib) by supplementing *by going* before the PP *from the window*, whereas sentence (iib) is illicit as the paraphrase of (9a):

- (i) a. John went into the room from the window.
= b. John went into the room by going from the window.
- (ii) a. John went from the window into the room.
≠ b. * John went from the window by going into the room.

¹¹ The preposition *from* is also compatible with NPs that denote Source, as shown below:

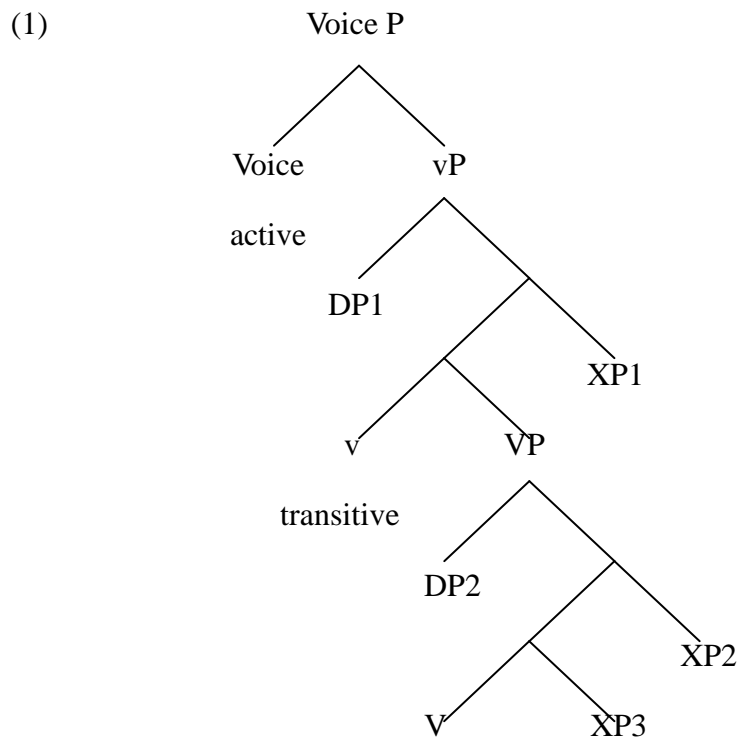
- (i) a. John went into the living room from the kitchen.
b. John went from the kitchen into the living room.

The exploration of this type of PP, however, is beyond the scope of this article.

Chapter 9

Conclusion

This thesis has shown that human language is devised as sensitive to the nature of event structure, and the hierarchical event structure theory was proposed.



- (2) [[[[V XP3] XP2] XP1]...]
- c-command relation: causality
 - mutual c-command relation: identity

Under the proposed theory, event structural relations between event-denoting elements are determined by their syntactic relations. The theory allows only two event structural relations: a causal relation and a further specification relation.

In this thesis, I have provided empirical evidence for the hierarchical event structure theory through explorations of the UPC effect, argument realization patterns of sound emission verbs and disappearance verbs, and the syntactic behavior of path phrases co-occurring with the motion verb *go*. All of the explorations point to the conclusion that event structure is determined by the hierarchical syntactic structure.

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