SEMANTIC NATURE OF VERBS
AND
KINDS OF RELATIVE CLAUSES

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Advisor: GUNJI Takao

By
SHIBUTANI Midori

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Dissertation Committee

Chairperson: GUNJI Takao

Member: NISHIGAUCHI Taisuke

Member: SPAELTI Philip

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Chapter 1 Introduction

1.1 Relative Clauses and Verbs

Among various types of Japanese relative clauses, the most familiar type of the relative clauses is exemplified as in (1). It is generally assumed that the head noun follows a relative clause, which contains a gap. The gap corresponds to the head. This kind of relative clause is called an Head-External Relative Clause.

(1) Ken-wa [[Aiko-ga tsukue-no ue-ni ϕ oita] *kukkii*]-o tabe-ta.
Ken-TOP Aiko-NOM desk-GEN on-LOC put cookies-ACC eat-PAST
'Ken ate cookies which Aiko put on a desk.
ケンはアイコが机の上においたクッキーを食べた。

Besides this type of relative clause, Japanese has other kinds of relative clauses. The kinds of those which we focus on this dissertation is the so-called Change Relatives (Tonosaki, 1998) and Head-Internal Relative Clauses. The former relative clause is illustrated as in (2a) whereas the latter relative clause is exemplified in (2b).

(2) a. Change Relative

Kate-wa [[tennensui-o wakashi-ta] no]-o non-da.
Kate-TOP natural.water-ACC boil-PAST no-ACC drink-PAST
'Kate drank the natural water which had been boiled.'
ケイトは天然水を沸かしたのを飲んだ。

b. Head-Internal Relative Clause

Kate-wa [tennensui-o kat-ta no]-o non-da.
Kate-TOP natural.water-ACC buy-PAST No-ACC drink-PAST
'Kate drank the natural water which she had bought.'
ケイトは天然水を買ったのを飲んだ。

The (2a)-type of relative clause is assumed to be a gapless and the particle *no* is the only element that can be regarded as the head noun in the matrix clause. However, the structure is identical to the most well-known relative clauses in Japanese, Head-Internal Relative Clauses, which are also ended with the particle *no* as in (2b). As Tonosaki (1996) has presented descriptive analysis on them, it

is largely assumed that Change Relatives do not behave the same way as Head-Internal Relative Clauses from the syntax point of view. However, Change Relatives are still confused with Head-Internal Relative Clauses. The main cause for misunderstanding between the two relative clauses is the notion of "property change" of an internal head of a Change Relative that Tonosaki defines in her analysis. The notion of "change" may be related with some elements in a Change Relative. In fact, Hiraiwa (2012) and Grosu and Hoshi (2016) mention that a certain type of verb, i.e., change of state verbs seem to occur in Change Relatives. In addition to their insight, various numbers of research on Head-Internal Relative Clauses may help to clarify what Change Relatives are theoretically. As Tonosaki (1996) indicates about the semantic change of property to the relative clause, we believe that using a semantic approach will be the best way to shed a light on the fundamental question: what is a Change Relative?

1.2 Objective of the Research

The primary objective of this dissertation is to give a theoretical explanation to Change Relatives. Considering some of the sentences of Change Relatives illustrated as in (2a) and (3), a certain type of verb is likely to occur in the construction of Change Relatives. That is a change of state verb as Hiraiwa (2012) and Grosu and Hoshi (2016) indicate in their research about the Head-Internal Relative Clauses and the similar relative clauses.

(3) [Otamajakushi-ga kaeru-ni nat-ta] no]-ga niwa-o hane-te-iru.
tadpole-NOM frog-COP become-PAST no-NOM yard-ACC hop-COP-PROG
'A frog that is the result of changing from a tadpole is hopping in the yard.'
オタマジャクシが蛙になったのが庭を跳ねている。
(Tonosaki, 1998, 144: (2c))

Based on the observation about the type of verb occurred in the Change Relative, we further investigate various kinds of change of state verbs in the later chapters. Some of those verbs can definitely occur in a Change Relative, and they bring about a sense of change to the property of an internal head of the relative clause. We present here some of the verbs that behave uniquely between the two relative clauses as follows.

(4) Change Relative

Ken-wa [[ki-o hot-ta] {no / mono}]-o kannso-sase-ta.
Ken-TOP wood-ACC carve-PAST {no / thing}-ACC dry-make-PAST

'Ken dried the thing that he carved.'
ケンは木を彫った { の / もの } を乾燥させた。

(5) Head-Internal Relative Clause

Ken-wa [butsuzoo-o hot-ta {no / *mono}]-o kannso-sase-ta.
Ken-TOP Buddha.statue-ACC carve-PAST {No / thing}-ACC dry-make-PAST

'Ken carved the statue of Buddha and dried it.'
ケンは仏像を彫った { の / *もの } を乾燥させた。

The verb *horu*, 'carve' can occur in both Change Relative and Head-Internal Relative Clause; however, the direct object of the verb is different. When a direct object is a type of NP which denotes some material like *ki*, 'wood' as in (4), the relative clause is treated as a Change Relative. The post-relative *no* refers to something that is carved. In short, the post-relative *no* can function as a pronominal and the semantic nature of the internal head in the relative clause undergoes a property change. On the other hand, the relative clause is treated as an Head-Internal Relative Clause when a direct object is a type of NP which denotes some product like *butsuzoo*, 'statue of Buddha' as in (5). The post-relative *no* does not function as a pronominal and the internal head is the 'statue of Buddha,' which is the direct object of the verb.

As we closely look into the semantic nature of the verb *horu*, this type of verb will obtain a sense of transformation when it combines with a NP like 'wood.' At the same time, the verb contains a result state or a resultant object in its lexicon non-truth conditionally. Whether or not a verb contains a result state can be attested to by the comparability with two kinds of temporal adverbials: a durative *for*-phrase and a nondurative *in*-phrase. (6) shows that the verb cannot have a result state truth conditionally when it occurs with the NP, 'wood.' The acceptability of a sentence with the nondurative adverbial phrase is slightly worse than the one with the durative phrase.

(6) a. Ken-ga ki-o 1-jikan(-no-aida) hot-ta.
Ken-NOM wood-ACC 1-hour(-GEN-for) carve-PAST
'Ken carved the wood for an hour.'
ケンが木を 1 時間（の間）彫った。

b. ?Ken-ga ki-o 1-jikan-de hot-ta.
Ken-NOM wood-ACC 1-hour-in carve-PAST
'Ken carved the wood in an hour.'
?ケンが木を 1 時間で彫った。

On the other hand, (7) shows that the verb can have a result state truth conditionally when it occurs with the NP, 'a statue of Buddha.' The acceptability of a sentence improves when it occurs with a nondurative adverbial phrase compared with the one with a durative phrase.

(7) a. ?Ken-ga 1-jikan(-no-aida) butsuzoo-o hot-ta.
Ken-NOM 1-hour(-GEN-for) Buddha.statue-ACC carve-PAST
'I carved the statue of Buddha for an hour.'
?ケンが 1 時間（の間）仏像を彫った。

b. Ken-ga 1-jikan-de butsuzoo-o hot-ta.
Ken-NOM 1-hour-in Buddha.statue-ACC carve-PAST
'I carved the statue of Buddha in an hour.'
ケンが 1 時間で仏像を彫った。

Another testing is the cancellation of the action denoted by a verb as the following examples present. If the action denoted by a verb can be canceled, the verb does not have a result state truth conditionally. We discuss further on this matter in Chapter 4.

(8) a. Ken-wa ki-o suujikan-no-aida hot-ta-kedo
Ken-TOP wood-ACC a.couple.of.hours-GEN-for carve-PAST-though
hore-nakat-ta.
carve-NEG-PAST
'Ken carved the wood for a couple of hours, but he could not carve it.
ケンは木を数時間の間彫ったけど、彫れなった。

b. *Ken-wa butsuzoo-o suujikan-de hot-ta-kedo
Ken-TOP statue.of.Buddha-ACC a.couple.of.hours-in carve-PAST-though
hore-nakat-ta.
carve-NEG-PAST
'Ken carved a statue of Buddha, but he could not carve it.'
*ケンは仏像を数時間で彫ったけど、彫れなかった。

Considering these differences existed in the verb *horu* from (6) to (8), we assume that the verb has a result state non-truth conditionally when it has a sense of transformation. When the verb has a sense of creation, it contains a result state truth conditionally.

Following from the observations about the change of state verbs like *horu*, we thoroughly examine the semantic nature of Change Relatives along with Head-Internal Relative Clauses and will tackle the following fundamental questions.

(9) a. What is a Change Relative?

b. What is the category of the post-relative *no* in a Change Relative as well as the one in an Head-Internal Relative Clause?

We attempt to clarify the mechanism of a Change Relative along with an Head-Internal Relative Clause in this dissertation.

1.3 Outline of the Dissertation

In Chapter 2, we will present brief summary of our theoretical device that is used to represent lexical meanings of verbs in the dissertation. Our representation system is the modified version of qualia structure with the two semantic levels, Truth-conditional Section and Non-truth conditional Section. The systems is based on the two well-known lexical theories: Lexical Conceptual Structure (Jackendoff, 1990) and Generative Lexicon (Pustejovsky, 1995). The modified qualia structure can capture the non-propositional meaning of a verb in its lexical information. We assume that some verbs contain non-propositional meanings as we briefly introduce the verbs like *horu*, 'carve.' It is very critical to be able to represent variable in the non-truth conditional level for discussing verbs like *horu*.

Chapter 3 introduces some previous studies on the two relative clauses: Change Relatives and Head-Internal Relative Clauses. We make a review of previous studies on these two relative clauses and clarify some differences that exist between these two relative clauses. Two of the differences are largely recognized among many researchers. One is the status of the post-relative *no*. Under a Change Relative environment, the post-relative *no* behaves as a pronominal whereas the *no* does not under an Head-Internal Relative Clause environment. The other difference is that the semantic property of the internal heads in the two relative clauses. The internal head in a Change Relative acquires a new sense of meaning by the action that a verb denotes in the relative clause meanwhile that of an Head-Internal Relative Clause does not as Tonosaki (1998) claims. We further clarify some other differences between the two relative clauses and provide assumptions about each relative clause.

In Chapter 4, we focus on lexical meanings of change of state verbs to give a lexical semantic representation for discussion of the two relative clauses. A certain type of verb, which is assumed to be a *horu*-type verb, can occur in the two relative clauses. Considering that this type of verb is also related with the other well-known phenomena so-called "argument alternations," we make a quick review of previous studies on the argument alternations. Many research on the argument alternations attempt to explain how arguments of the verbs are realized syntactically. Among many syntactic as well as semantic approaches, we make use of some semantic approach suggested by Levin and Rappaport Hovav (2005). We provide some Japanese change of state verbs with lexical semantic representations and indicate that some change of state verbs shift their meanings depending on the direct objects.

Finally, we discuss the mechanism of two relative clauses in Japanese in Chapter 5. We attempt

to confirm that verbs occurred in Change Relatives are mainly change of state verbs and that the semantic predicate BECOME is the key factor for treating a relative clause followed with *no* as a Change Relative. Furthermore, we clearly indicate what is the category of the post-relative *no* in a Change Relative by making a comprison with that of an Head-Internal Relative Clause.

Chapter 2 Methodology

2.1 Introduction

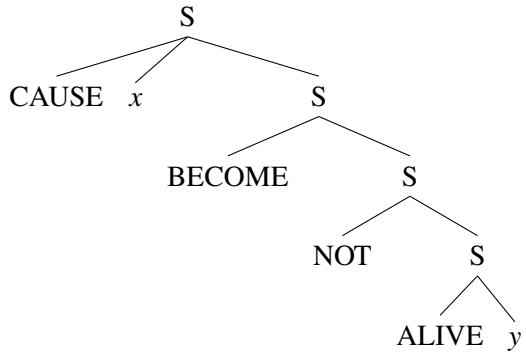
This chapter explains our theoretical device adopted in this dissertation. We will examine extensively on semantics of verbs and verbal phrases in the dissertation. For that purpose, we use one of the theoretical approaches designed for capturing multiple meanings of verbs. Among such approaches, we use the modified version of the lexical semantic representation, which is based on the ideas of the 'Lexical Conceptual Structure (LCS)' (Jackendoff, 1990) and the 'Generative Lexicon (GE)' (Pustejovsky, 1995).

Our system consists of ideas of the two theories: LCS for a verbal meaning and GE for a whole lexical structure. For better understanding of the device, I will first give a brief explanation about each of the theories. Then, a brief introduction of our theoretical device adopted in the dissertation follows.

2.2 Lexical Conceptual Structure

The idea of Lexical Conceptual Structure has evolved from the Generative Semantics ('GS') (McCawley, 1968; Lakoff, 1972; Ross, 1972) among others in which meanings of verbs are decomposed into primitive semantic elements in the underlying structure. They equated a lexical meaning of a verb with its syntactic structure and tried to integrate the meanings of verbs into syntax. Following their idea, the verb *kill* in a sentence like *Harry killed the rat* can be decomposed into components as *cause to die*. The component *die* can be further semantically broken down into 'cease to be alive', i.e. 'become not alive.' The verb *kill* then can be analyzed into components CAUSE, BECOME, NOT, and ALIVE in (10). The tree represents the underlying structure of *x kills y*. These four components are needed to form a unit by so-called 'predicate raising' (McCawley, 1973) before the single word *kill* is inserted.

(10)



(McCawley, 1973, 157: (Fig.3))

The theory itself shed light on the conceptual meanings of words and attempted to explain the generative grammar from the point of view of semantics. However, this approach had come under severe criticism since it easily allowed to have many unnatural syntactic structures or transformational rules.

Although the approaches of GS were not successful, a number of ideas from the theory have been incorporated into many other semantic approaches. One of such ideas is to elaborate decomposition of lexical meanings of verbs, which can be quite a useful approach (Kageyama, 1996, 6). Dowty (1979) suggests that the lexical decomposition analysis should be formulated within the logical semantic formula of verbs. He states that in this way the meanings of verbs can be explained as some kind of combination of aspectual connectives and operators with stative predicates, which he calls it the 'aspect calculus.' In fact, Jackendoff (1990, 1983) developed the idea of lexical decomposition and invented his own conceptual semantics, which lead to the semantic representation system, LCS. The system has also been proposed by many others such as Levin and Rappaport Hovav (1995), Kageyama (1996), etc. Unlike GS, LCS sets certain linking rules that specify how the elements of the conceptual meanings of verbs can be realized into the related syntactic representations.

2.2.1 Jackendoff 1990

Jackendoff (1990, 12) first introduces the idea of the *conceptual structure* and argues that the structure is at the level of mental representation in which speakers encode their understandings of the world. This structure represents the conceptual meaning, which is one of the two parts of meanings of words that is said to have, i.e. the conceptual meaning and connotative meaning (Kageyama, 1996, 47).

Jackendoff (1990) assumes that the conceptual structure consists of the essential units called *conceptual constituents*, each of which belongs to one of primitive semantic categories, or conceptual "parts of speech," such as Thing, Event, State, Action, Place, Path, Property, and Amount

(Jackendoff, 1990, 22). He applies the basic formation rules of X-bar syntax in (11) to a basic formation rule for the conceptual parts of speech as in (12).

(11) XP → Spec – X'
X' → X – Comp
X → [±N, ±V]
(Jackendoff, 1990, 24: (15))

(12) $\left[\text{Entity}\right] \rightarrow \begin{bmatrix} \text{Event/Thing/Place/} \ldots \\ \text{Token/Type} \\ \text{F } (<\text{Entity}_1, <\text{Entity}_2, <\text{Entity}_3 >>>) \end{bmatrix}$
(Jackendoff, 1990, 24: (16))

This representation system in (12) indicates that Entity consists of three basic feature complexes. [Entity] corresponds to the syntactic phrase, XP, and each entity in F, which stands for function, corresponds to complements of any lexical items of XP (Jackendoff, 1990, 25).

Based on the general form given in (12), Jackendoff (1990, 43) elaborates the conceptual categories into a function-argument structures, some important ones of which are shown in (13).

(13) a. $\left[\text{PLACE}\right] \rightarrow \left[_{Place}\ \text{PLACE-FUNCTION } (\text{[THING]})\right]$

b. $\left[\text{PATH}\right] \rightarrow \left[_{Path} \begin{Bmatrix} \text{TO} \\ \text{FROM} \\ \text{TOWARD} \ldots \end{Bmatrix} \left[\left\{ \begin{matrix} \text{THING} \\ \text{PLACE} \end{matrix} \right\}\right] \right]$

c. $\left[\text{EVENT}\right] \rightarrow \left\{ \begin{array}{l} [_{Event}\ \text{GO } (\text{[THING]}, \text{[PATH]})]] \\ [_{Event}\ \text{STAY } (\text{[THING]}, \text{[PLACE]})] \\ [_{Event}\ \text{CAUSE } (\left[\left\{ \begin{matrix} \text{THING} \\ \text{EVENT} \end{matrix} \right\}\right], \text{[EVENT]})] \end{array} \right\}$

d. $\left[\text{STATE}\right] \rightarrow \left\{ \begin{array}{l} [_{State}\ \text{BE } (\text{[THING]}, \text{[PLACE]})] \\ [_{State}\ \text{ORIENT } (\text{[THING]}, \text{[PATH]})] \\ [_{State}\ \text{EXT } (\text{[THING]}, \text{[PATH]})] \end{array} \right\}$

Following Jackendoff (1990, 43-46), (13a) indicates an entity, which is a conceptual constituent belonging to the category of Place. It consists of a Place-function with its argument that belongs to the category of Thing. The argument provides a spatial reference point such as *the table* in a phrase of *under the table*, in which *under* expresses a Place-function. In (13c), the category Event consists

of one of the Event functions, GO, STAY or CAUSE, each of which takes two arguments. The arguments of GO, for instance, which denotes motion along a path, indicate the Thing in motion and the Path as it travels across. The example sentence of this structure can be seen in a sentence like *Bill went to New York*. The arguments of STAY, which denotes stasis over a period of time, indicate the Thing in unmoving and the Place as it locates as seen in a sentence like *Bill stayed in the study room*. The first argument of CAUSE indicates Agent if it is a Thing, or Cause if it is an Event. The second one indicates the Effect, which denotes an affected entity in the event. These are some of the basic rules for expressing lexical information of a word.

Let us briefly show how the system works. Jackendoff illustrates how to operate by giving an example sentence like *John ran into the room*. He gives a syntactic structure of the sentence as well as the conceptual structure of it as follows.

(14) a. Syntactic structure
[$_S$ [$_{NP}$ John][$_{VP}$ ran [$_{PP}$ into [$_{NP}$ the room]]]]

b. Conceptual structure
[$_{Event}$ GO ([$_{Thing}$ JOHN], [$_{Path}$ TO ([$_{Place}$ IN ([$_{Thing}$ ROOM])])])]

(Jackendoff, 1990, 45: (2a, b))

(14a) corresponds to the entire Event as the structure in (13c). The verb *ran* corresponds to the Event-function, GO, which expresses motion. The subject, *John* corresponds to the first argument of GO, and PP corresponds to the second argument. This second argument is a composition of two functions: the Path-function TO and a Place function.

The way of putting together to form (14b) from small parts of words is described in (15) by using two words *into* and *run* in (14). In the structure, *into* or *run* represents an entry of a lexical item. P or V represents a token/ type, in which case P stands for a preposition and V for a verb, respectively.

(15) a. $\begin{bmatrix} \text{into} \\ \text{P} \\ \underline{\quad\quad} \text{ NP}_j \\ [_{Path} \text{ TO } ([_{Place} \text{ IN } ([_{Thing} \quad]_j)])] \end{bmatrix}$

b. $\begin{bmatrix} \text{run} \\ \text{V} \\ \underline{\quad\quad} <\text{PP}_j> \\ [_{Event} \text{ GO } ([_{Thing} \quad]_i, [_{Path} \quad]_j)] \end{bmatrix}$

(Jackendoff, 1990, 45: (3a, b))

Into has a subcategory of an NP object, which is coindexed with the open argument position in the conceptual structure. *Run* expresses a GO-function and it requires two arguments: Thing in motion and the Path that specifies the orientation of motion. The first of the two arguments is indexed with *i*, which indicates a subject position. The other one is filled in with the reading of the prepositional phrase (PP), *into*. If no PP is present syntactically, the Path function is unspecified. A sentence, *John ran* means he ran toward some unspecified places or so. In other words, <PP> is only required to be positioned in the conceptual structure for the semantic well-formedness. Jackendoff calls this "implicit argument."

He also gives another example of how the conceptual structure can explain the implicit meanings of verbs. The verb, *enter* in the sentence *John entered the room* can have the following lexical conceptual structure.

(16)
$$\begin{bmatrix} \text{enter} \\ \text{V} \\ \text{\_\_\_\_\_}\langle \text{NP}_j \rangle \\ [_{Event}\ \text{GO}\ ([_{Thing}\ \ ]_i, [_{Path}\ \text{TO}([_{Place}\ \text{IN}\ ([_{Thing}\ \ ]_j)])] \end{bmatrix}$$

(Jackendoff, 1990, 46: (5))

Enter contains the meanings of the Path and Place functions, which correspond to the structure of *into* in (15a). Unlike *run*, the second argument is a Thing and is expressed by NP. Even if the second argument is not represented in a sentence like *John entered*, the sense of *into* does appear as the IN of Path function in the construction represents the conceptual meaning.

The system also stipulates selectional restrictions for each argument. Jackendoff argues that the selectional restrictions are the general semantic restriction on arguments, which are part of conceptual structure. For example, the arguments in (17), which are not syntactically expressed, can be supplied with explicit information by the verbs. Harry can be interpreted to have consumed a liquid and Bill to have given away some amount of money. These information such as 'liquid' or 'money' can be obtained from the meanings of the verbs. It can be regarded as a part of the verb's meaning and should be integrated into the verb's argument structure (Jackendoff, 1990, 52).

(17) a. Harry drank (again).

b. Bill paid.

(Jackendoff, 1990, 52: (11))

He suggests the selectional restrictions can be treated as ordinary conceptual structures as in (18). In this case, *drink* will have a conceptual information 'liquid' within the constituent indexed *j*. An NP argument which is related with a direct object of the verb 'drink' goes into this position. The NP is *fused* or *merged* with this semantic information in the constituent. In this way, a type of a NP can have a unified reading. If an NP is not realized syntactically, the conceptual element, 'liquid' remains unspecified since there is no NP to be fused with the *j*-indexed element. But it can still have the implicit reading of *liquid* in the sentence like *Harry drank*. When an NP is realized, there occurs Argument Fusion which combines the reading of NP with the constituent $[_{Thing}$ LIQUID $]_i$. The redundant semantic feature of 'liquid' is deleted in a sentence like *Harry drank the wine*.

(18)
$$\begin{bmatrix} \text{drink} \\ \text{V} \\ \text{\_\_\_\_\_}<\text{NP}_j> \\ [_{Event}\ \text{CAUSE}\ ([_{Thing}\ \ ]_i\ [_{Event}\ \text{GO}\ ([_{Thing}\ \text{LIQUID}]_j, \\ \qquad [_{Path}\ \text{TO}\ ([_{Place}\ \text{IN}\ ([_{Thing}\ \text{MOUTH OF}\ ([_{Thing}\ \ ]_i)])])])])] \end{bmatrix}$$

These examples show how the system of the conceptual structures basically works. Based on this framework, Kageyama (1996) refines some of the semantic primitives and makes them more suitable to meanings of verbs, especially Japanese verbs.

2.2.2 Kageyama1996

Kageyama (1996, 41-89) thoroughly inspects the semantic nature of Japanese verbs as well as English ones, adopting the Vendler's four categories as in (19), which are separated on the basis of verbs' aspectual behaviors (Vendler, 1967). He also refers to the similar type of verb classification for Japanese by Kindaichi (1950). He proposes the appropriate lexical conceptual structures for those four categories with the revised version of semantic predicates in the process of providing a solution to some issues regarding the unaccusativity of verbs.

(19)

States	Achievements	Activities	Accomplishments
know	recognize	run	paint a picture
believe	spot	walk	make a chair
have	find	swim	draw a circle
desire	reach	push a cart	push a cart (to the supermarket)
love	die	drive a car	recover from illness

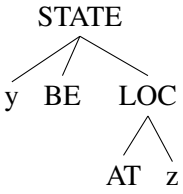
These four categories of the verbs are shown in the following diagrams along with the linear representations (Kageyama, 1996, 50-69). Semantic predicates that Kageyama refined and proposed

in his study are ACT, ACT-ON, CAUSE, BE, BECOME, MOVE, etc. A whole semantic structure of a verb is governed by conceptual categories such as STATE, EVENT or so as shown in the tree diagrams. As for the linear forms, Jackendoff indicates the types of conceptual categories in those forms such as *STATE* or *LOC* in [$_{\text{STATE}}$ y BE [$_{\text{LOC}}$ AT *z*]]. These information is a little redundant and usually omitted. The elements such as *x* or *y* are variables which correspond to noun phrases or arguments in syntactic structures. Since a reduced linear form like [*y* BE AT *z*] is now widely accepted, we will use the reduced one hereafter.

First, the state verbs denote the resting state which involves neither motion nor activities. They are considered to be the most basic event type among the Vendler's four categories in (19). The lack of progressive aspect in this type of verb is a widely accepted notion. The semantic predicate BE represents 'a state of being' that the stative verbs denote. It also contains a sense of continuity. The semantic predicate 'AT' abstracts the meaning of physical location as well as psychological situation.

The form [*y* BE AT *z*] denotes that *y* is in *z* as in a phrase *Nihon-ni kanojo wa iru*, 'she is in Japan.' It can also denote abstract situation like *she is healthy*. In this case, *healthy* is an argument of LOC.

(20) States: [*y* BE AT *z*]



The predicate BE can also be used to represent the meaning of verbs of possession such as *have*. As for Japanese, *aru* or *iru* can also denote a sense of possession along with the sense of existence as in (21).

(21) a. Existence:

Shachootaku-no gareeji-ni-wa kookyuusha-ga 3-daimo aru.
company.president.house-GEN garage-at-TOP expensive.car-NOM 3- be

'There are three expensive cars in the company president's garage at home.'

社長宅のガレージには高級車が 3 台もある。

b. Possession:

Shachoo-ni-wa kookyuusha-ga 3-daimo aru.
company.president-at-TOP expensive.car-NOM 3- be

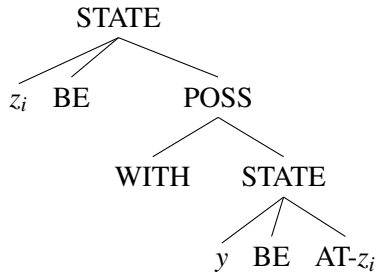
'The company president has three expensive cars.'

社長には高級車が 3 台もある。

(Kageyama, 1996, 53: (15))

Kageyama provides one of the ways to represent this lexical meaning of possession with the semantic predicate BE and WITH to form 'BE WITH' as in (22), which is inspired by the idea of Pinker (1989).

(22)



(Kageyama, 1996, 55: (19))

Then, the achievement verbs of Vendler's four categories are said to be distinguished by testing with the temporal adverbials: *for*-phrases and *in*-phrases. They are generally compatible with *in*-phrases and not with *for*-phrases as in (23). These verbs entail change of location as well as denote instantaneous events. Such events which take place *in* time can be captured by the semantic predicate BECOME as in the form [BECOME [y BE AT-z]] in (24).

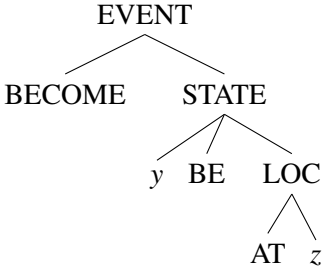
(23) a. The train arrived / left in an hour / at eleven.

b. *The train arrived / left for an hour.

(Kageyama, 1996, 57: (21a, 21b))

In other words, they contain a telic sense of meaning such as *toochaku suru*, 'reach' in a sentence like *Jon-wa Bosuton-ni toochaku shita*, 'John reached Boston.' This sentence implies that John actually got to Boston, which focuses on the telic situation. Kageyama (1996, 57) proposes BECOME for denoting inchoative aspect[1].

(24) Achievements: [BECOME [y BE AT z]]



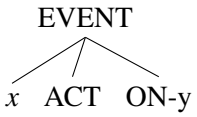
[1] Jackendoff (1990, 75) formalizes the inchoative aspect as the function INCH.

As for activities, Kageyama (1996, 67-74) explains that there seems to have been no accepted notion of representing these verbs with a certain type of semantic predicate. Dowty (1979) postulates the semantic predicate DO as an activity verb. He argues that DO can best be described as "state under the unmediated control of the agent (Dowty, 1979, 118)." Kageyama (1996) argues the phrase 'agent' in this definition of DO may give a misleading information of having a notion of intentionality. Instead of the semantic predicate DO, he proposes "ACT", which is also adopted by Pinker (1989), for indicating atelic aspect of activity verbs.

Kageyama further classifies the activity verbs into two types considering fundamental meanings of the verbs. One of the two is defined as a one-place predicate of unergative and the other is as a two-place predicate of transitive. Verbs such as *walk, swim*, or *work* are regarded as an unergative and can be represented with the semantic predicate, ACT as in (25a). The other verbs such as *touch, hit*, or *kick* are regarded as a transitive without having the sense of change of state. This type of construction can be seen in a sentence as *Biru no ashi-o tataita*, 'I hit Bill's leg.' It can be represented with ACT-ON as in (25b).

(25) a. Activities: unergative [*x* ACT]

b. Activities: transitive [*x* ACT ON *y*]



Finally, verbs such as *kill, break*, or *put* are considered to be accomplishments (Vendler, 1967). These verbs can be described as 'bringing about *p* for some proposition *p*' (Dowty, 1979, 91). In other words, they contain the sense of change of state or change of place, which are caused by agents externally. They will contain the notion of 'causation' lexically. This notion of causation is defined as the semantic predicate of 'CAUSE,' which is treated as a kind of sentential connective (Dowty, 1979, 91). It combines two semantic predicates or conceptual structures in the sense of Jackendoff or Kageyama: the change of state predicate containing BECOME and activity predicate containing ACT. The following examples of (26) and (27) show the idea of the approach of CAUSE as the sentential connective.

(26) a. John killed a rat.

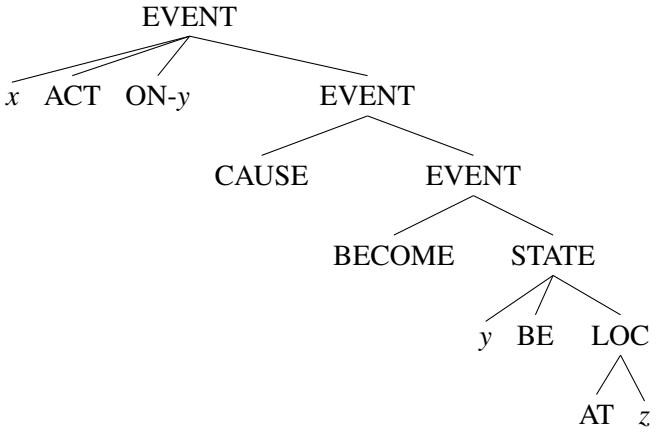
b. [[*John does something*] CAUSE [BECOME NOT [*a rat is alive*]]]
(Dowty, 1979, 91: (97) with modification)

(27) a. John painted a picture.

b. [[*John paints*] CAUSE [BECOME [*a picture exists*]]]
(Dowty, 1979, 91: (98))

Following the examples given above, accomplishment verbs semantically consist of two parts, which can be formulated as follows.

(28) Accomplishment: [*x* ACT ON *y*] CAUSE [BECOME [*y* BE AT *z*]]



The analysis of CAUSE as a sentential connective can even represent a certain accomplishment construction as in (29).

(29) a. Jesse shot him dead.

b. She painted the house red.

c. She hammered the metal flat.

d. He swept the floor clean.

(Dowty, 1979, 93: (103))

Each activity verb in (29) combines with an object and an adjective phrases to give a sense of accomplishment. The verbs denote some activities which bring about the result states of the objects that the adjectives describe as a consequence. For example, the sentence like *he swept the floor clean* in the above can be represented in (30).

(30) [[*He sweeps the floor*] CAUSE [BECOME [*the floor is clean*]]

(Dowty, 1979, 93: (105))

In summary, as seen from the examples above, a certain kind of combinations of semantic primitives or primitive predicates such as ACT (ON), CAUSE, BECOME, or BE, which takes the form of a predicate decomposition, represent structural aspect of verb meanings. These primitives combine in various ways to constitute a large number of lexical semantic templates of a language, which correspond to the event types (Rappaport Hovav & Levin, 1998, 106-107).

2.2.3 Linking Rules

As can be seen from the above structures with predicate decomposition, LCS is a predicate-centered lexical semantic representation which focuses on the aspects of the verb meanings. Under the system, the semantic roles, so-called θ-roles, are assumed to be part of the conceptual structures, not part of syntax (Jackendoff, 1990, 46). It is not necessary to label the roles separately. In LCS, the θ roles can be recoverable from a particular argument position in the conceptual structure. For example, Agent is defined as the first argument, *x*, of ACT or ACT ON as in (31b) and (32b), whereas Patient is formally defined as the second argument, *y*, of ACT ON as in (32b). Theme is defined as the first argument, *y*, of any of the functions such as GO, BE, or MOVE.

(31) a. Bill threw Harry the ball.
b. [*x* ACT] CAUSE [*y* MOVE TO *z*]

(32) a. Harry forced Sam to go away.
b. [*x* ACT ON *y*] CAUSE [*y* BECOME BE AT *z*]

LCS also assumes an intermediate level of semantic roles called 'linking hierarchy' between the semantic and syntactic levels, which parallels to the linking theory of Grimshaw (1990), Levin and Rappaport Hovav (1995). They call it 'Argument Structure (AS)' in (33). Both ideas, LCS and the linking theory, assume that predicate arguments bear thematic relations or θ-roles, such as Agent, Patient, Theme, Goal, and so on, in AS. In this way, they set up certain linking rules that guarantee the mapping of conceptual arguments onto their related position in the syntactic configurations.

(33)
Lexical Conceptual Structure
|
Argument Structure
|
Syntax

We briefly explain how the linking rule operates with the LCS of the accomplishment verb, which is defined by Kageyama (1996). He says that the accomplishment can have the following semantic structure as in (34) because this type of verb has sense of change of state or change of place as well as that of activities. The verb contain two subevents: change of state or place and activities. He considers the change of state or place as a result subevent and the activities as a causing subevent. In short, the achievement verbs can be described as the combination of causing and result subevents.

(34) [x ACT (ON y)] CAUSE [BECOME [y BE AT-z]]
(Kageyama, 1996, 91: (95))

In (34), the subject of the function ACT, *x*, which is Agent, is mapped to an external argument in the syntactic configuration. The subject of BE, *y*, Patient, is linked to an internal argument. As for activities without sense of changes, which have no lower subevents, the subject of ACT-ON, *x* is mapped to an external argument and the second element, *y* to an internal argument. The rules are summarized by Kageyama (1996) as shown in (35).

(35) Linking Rules from LCS to Argument Structure

a. Rules of external arguments:

The subject of the causing event is projected to an external argument.

b. Rule of internal arguments:

The subject of BE is projected to an internal argument if a verb has a lower subevent. Otherwise, the second element of ACT-ON is projected as an internal argument.

(Kageyama, 1996, 92: (97))

We have seen the usefulness of the mechanism of LCS when examining the propositional meaning of verbs. However, the system cannot capture some non-propositional information which do not usually fall under the propositional meaning even though such kind of information can still be regarded as lexical (Hidaka, 2011). Now, we briefly introduce one of the theories which can capture not only the propositional meaning of verbs but also non-propositional meaning of them: the theory of Generative Lexicon. The theory can deal with non-propositional lexical meaning which is neither pragmatic nor world knowledge. It attempts to capture the flexibility of compositional aspects of human languages.

2.3 Generative Lexicon

The theory of Generative Lexicon deals with the semantics of words and the nature of compositionality. The outline of the theory was given by Pustejovsky (1995). He argues that a *generative lexicon* is the organization: 'a core set of word senses, typically with greater internal structure than is assumed in previous theories, is used to generate a large set of word senses when individual lexical items are combined with others in phrases and clauses (Pustejovsky, 1995, 2).' In other words, he assumes that a language has the generative operational system of extending and creating senses of lexical items.

He designs the computational system with four levels of semantic representations: an *argument structure*, an *event structure*, a *qualia structure*, and a *lexical inheritance structure*. The argument structure specifies the number and type of arguments that a lexical item carries. The event structure characterizes not only the event type of a lexical item but also subeventual structure of events. The

qualia structure represents different modes of predication. The lexical inheritance structure identifies how a lexical structure is related to other structures in the lexical dictionary.

Three of these four structures are main levels of representations for lexical entries. Let us show how the three levels work together to represent a lexicon, by using the verb, *build*.

(36)
$$\begin{bmatrix} \textbf{build} & \\ \text{ARGSTR} = & \begin{bmatrix} \text{ARG 1:} = \begin{bmatrix} x\text{: } \textbf{\textit{animate}} \\ \text{FORMAL} = \textbf{physobj} \end{bmatrix} \\ \text{ARG 2} = \begin{bmatrix} y\text{: } \textbf{\textit{artifact}} \\ \text{CONST} = z \\ \text{FORMAL} = \textbf{physobj} \end{bmatrix} \\ \text{D-ARG 1} = \begin{bmatrix} z\text{: } \textbf{\textit{material}} \\ \text{FORMAL} = \textbf{mass} \end{bmatrix} \end{bmatrix} \\ \text{EVENTSTR} = \begin{bmatrix} \text{E 1} = \mathbf{e_1}\text{: } \textbf{process} \\ \text{E 2} = \mathbf{e_2}\text{: } \textbf{state} \\ \text{RESTR} = <_\alpha \\ \text{HEAD} = e_1 \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \textbf{\textit{create}} \\ \text{FORMAL} = \textbf{exist}\ (\mathbf{e_2}, y) \\ \text{AGENTIVE} = \textbf{build\_act}\ (\mathbf{e_1}, x, z) \end{bmatrix} \end{bmatrix}$$

The argument structure (ARGSTR) has three arguments: two true arguments of ARG 1 and ARG 2 and one default argument of D-ARG 1. The true arguments are syntactically realized and the default argument is not necessarily expressed syntactically.

The event structure (EVENTSTR) describes one or more of three sorts: *state*, *process*, and *transitions*. These sorts will take the internal subeventual structure to represent the temporal relation between an event ant its subevents. It also defines the head of the event.

The qualia structure (QUALIA) gives 'a relational force of a lexical item (Pustejovsky, 1995, 76).' The structure is composed of the following four elements, which specify essential aspects of a word's meaning (or *qualia*) (Pustejovsky, 1995, 76).

- CONSTITUTIVE (CONST) : the relation between an object and its constituent;
- FORMAL: that which distinguishes it within a larger domain;

- TELIC: its purpose and function;
- AGENTIVE (AGENT) : factors involved in its origin or "bringing it about."

In the example (36), two of these four elements are associated with the verb. The formal role expresses the existence of an object ARG 2 by the act indicated in the agentive role.

GL also attempts to capture the logically polysemous behavior of nominals such as *newspaper* with this theoretical framework. *Newspaper* has some distinct interpretations in the following sentences. The word sometimes functions as an organization in (37a) or a product in (37b).

(37) a. The newspaper attacked the President for raising taxes.
b. Mary spilled coffee on the newspaper.
(Pustejovsky, 1995, 92: (10))

With the framework, *newspaper* can be represented as in (38). The formal role refers to the product as in ARG 2. The agentive role denotes *newspaper* as a producer. The telic role indicates that *newspaper* is used for reading. The representation expresses the multiple meanings of the word.

(38)
$$\begin{bmatrix} \textbf{newspaper} \\ \text{ARGSTR} = \begin{bmatrix} \text{ARG 1} = \textbf{x: org} \\ \text{ARG 2} = \textbf{y: info} \cdot \textbf{physobj} \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \textbf{org} \cdot \textbf{info} \cdot \textbf{phyobj} \\ \text{FORMAL} = \textbf{y} \\ \text{TELIC} = \textbf{read}\ (\mathbf{e_2}, \mathbf{w}, \mathbf{y}) \\ \text{AGENT} = \textbf{publish}\ (\mathbf{e_1}, \mathbf{x}, \mathbf{y}) \end{bmatrix} \end{bmatrix}$$
(Pustejovsky, 1995, 156: (34))

The four levels of semantic representation in GL can express a variety of lexical information. The information of these levels can capture the generative interpretation of a word assumed to have, using some generative devices such as *coercion*, or *co-composition*, which connect the four levels and transform meanings of a word in context.

In this way, GL can have a power to contain a certain kind of information which has long been considered to be pragmatic or "commonsense knowledge." As Pustejovsky (1995), Kageyama (2005) and others argue that some types of information should be treated as language specific knowledge even though there appears to be a continuum between the linguistic information and commonsense knowledge. As shown in the following examples, a certain type of pragmatic information is assumed to be contained in a lexicon. In (39), the (b) case shows that the verb *nyuugakusuru*,

'enroll' entails a purpose of studying something at the school. This entailment does not contradict the purpose that is stated in the sentence whereas the (a) case shows the contradiction. On the other hand, the verb *(gakkoo-ni) hairu*, 'enter' does not entail any specific manner or objects of the act of entering. Such information varies in accordance with the context so that the *hairu* in both (a) and (b) are acceptable.

(39) a. Musuko-wa mizu-o nomu tameni sono gakkoo-ni {hait / *nyuugakushi}-ta.
son-TOP water-ACC drink for the school-DAT {enter / enroll}-PAST
'My son {entered / enrolled} the school to drink water.'
息子は水を飲むためにその学校に {入った / *入学した}。

b. Musuko-wa gengogaku-o manabu tameni sono gakkoo-ni {hait/nyuugakushi}-ta.
son-TOP linguistics-ACC study for the school-DAT {enter / enroll}-PAST
'My son {entered / enrolled} the school to study linguistics.
息子は言語学を学ぶためにその学校に {入った / 入学した}。
(Kageyama, 2005, 70: (8) with modification)

The entailment contained in a verb such as *nyuugakusuru*, which contains the purpose of studying, usually regarded as non-linguistic information, can be described with GL (Kageyama, 2005, 70-71). Although Pustejovsky (1995) assumes that GL can apply to not only nominals or verbs but all parts of speech in languages, his discussion on verbs are not so clear compared with nominals. In that respect, Kageyama (2005) proposes the elaborated version of the qualia structure in GL.

2.3.1 Qualia Strucutre with LCS

Kageyama (2005) proposes the following redefinition of qualia structure for verbs, taking into account the original intension of those roles. He suggests that LCS is a suitable form for the constitutive role in the qualia structure since in a way, LCS represents 'the relation between an object and its constituent parts.'

(40) a. FORMAL: the type of eventuality of the verb (activity, state, process, transition)
b. CONST: LCS of the verb
c. TELIC: the purpose, goal or function which the verb entails
d. AGENT: the presupposition or frame which makes the verb come into being
(Kageyama, 2005, 83-84: (26))

He shows the following qualia of *sagas(u)*, 'look for' to indicate how his proposed representation works. FORMAL represents the event type of *sagas* as process, which denotes unbounded

continuous event. The LCS in CONST represents the move, in which the subject (x) moves his/her eyes along a route. TELIC denotes the purpose of the verb, in which the subject (x) moves to find something (y). AGENT denotes the presupposition of the action which the verb *sagas* indicates.

(41)
$$\begin{bmatrix} \textit{sagas} \text{ 'look for'} \\ \text{QUALIA} = \begin{bmatrix} \text{FORMAL} = \text{process} \\ \text{CONST} = [\quad] \text{ x CONTROL } [\text{GAZE-OF- } [\quad] \text{ x MOVE } [_{\textit{Route}} \quad]] \\ \text{TELIC} = \textbf{find} \text{ (e, x, y)} \\ \text{AGENT} = \textbf{not-have} \text{ (x, y)} \end{bmatrix} \end{bmatrix}$$

(Kageyama, 2005, 85: (27))

Combining LCS into CONST in Qualia structure can give a clear sense of the semantic class of verbs and explain any entailments along with other quale roles in the structure (Kageyama, 2005, 85).

2.3.2 Lexical Semantic Representation

In this dissertation, we employ the modified version of Kageyama's qualia strucutre, which Hidaka (2011) proposes. The main difference in representation is that Hidaka divides the four basic roles in the qualia structure into two semantic levels, *Truth-conditional Section (TS)* and *Non-truth-conditional Section (NTS)*. FORMAL and CONST belong to TS whereas TELIC and AGENT belong to NTS.

Hidaka argues that variables in TELIC and AGENT[2] in NTS are not included in the propositional meaning of a verb, which are not linked to Argument Structure. They are not directly related to syntax, but by way of variables in TS, which have direct relation to syntax. In short, the two elements in TS are directly projected to the argument structure in the sense of Grimshaw (1990), Jackendoff (1990), Levin and Rappaport Hovav (1995), Kageyama (1996), and others, while the other two elements in NTS are not. Based on these definition, we adopt the following lexical semantic representation for our analysis.

[2]Hidaka (2011) calls the Agentive role, which is the original term introduced by Pustejovsky (1995), as TRIGGER to avoid any confusion that might create because of the semantic role term "Agent" is usually associated with.

(42)
$$\begin{bmatrix} \text{ARG} = \left[\text{Argument structure}\right] \\ \text{QUALIA} = \left[\begin{bmatrix} \textit{Truth-conditional Section} \text{ (TS)} \\ \text{FORMAL: the eventuality of a verb} \\ \text{CONST: LCS of a verb} \end{bmatrix} \right. \\ \left. \begin{bmatrix} \textit{Non-truth conditional Section} \text{ (NTS)} \\ \text{TELIC: the resultative state which a verb entails} \\ \text{AGENT: the external factors which a verb brings in} \end{bmatrix}\right] \end{bmatrix}$$

The basis of his proposal of separating the four qualia into two semantic sections is the aspectual behaviors of a certain type of change of state verbs as in (43).

(43) ni(ru) (simmer), yak(u) (burn), itame(ru) (stir-fry), mus(u) (steam), araw(u) (wash), migak(u) (polish), huk(u) (wipe)
煮る，焼く，炒める，蒸す，洗う，磨く，拭く
(Hidaka, 2011, 31: (39b))

Following Hidaka, these verbs accept not only atelic interpretation but also telic interpretation though the acceptability of latter is slightly lower than that of the former when they cooccur with delimited time adverbial. For example, the verb *niru* in (44a) can occur with a durative phrase such as *10-pun-kan*, 'for ten minutes,' which denotes nondelimited eventuality. On the other hand, the verb can also occur with a nondurative time phrase as *10-pun-de*, 'in ten minutes' in (44b) though it has slightly lower acceptability. However, telicity can be clearly attested by the phrase *-tearu*, which is assumed to refer to resultative states. *Niru* can cooccur with the phrase *-tearu* as in (45a) whereas those inherently activity verbs, which have semantic predicates of ACT or ACT ON, cannot occur with such a phrase as in (45b).

(44) a. Ken-wa sono-sakana-o 10-pun-kan ni-ta
Ken-TOP the-fish-ACC 10-minute-for simmer-PAST
'Ken simmered the fish for ten minutes.'
ケンはその魚を 10 分間煮た。

b. ?Ken-wa sono-sakana-o 10-pun-de ni-ta
Ken-TOP the-fish-ACC 10-minute-in simmer-PAST
'Ken simmered the fish in ten minutes.'
?ケンはその魚を 10 分で煮た。

(45) a. Sono-sakana-wa ni-tearu
the-fish-TOP simmer-has.been
'The fish has been simmered.'
その魚は煮てある。

b. *Sono-neko-wa nade-tearu
the-cat-TOP stroke-has.been
'The cat has been stroked.'
*その猫は撫でてある。
(Hidaka, 2011, 35: (45b, c))

He claims that the *niru* type of verb behaves like a combination of an ACT-ON verb such as *nade(ru)* 'stroke,' allowing only atelic interpretation and a causative verb such as *kowas(u)* 'break,' allowing only telic interpretation. The slight difference which the *niru* type of verb is assumed to have can be clearly formalized in the semantic representation with LCS of CONST in Qualia structure along with the variables in AGENT, which represents presupposition and TELIC, which represents the purposes of the act that a verb denotes. He also suggests that the event structure can be replaced with CONST since LCS represents the propositional contents of verbs (Hidaka, 2011, 10).

Now, let us show how the system can convincingly capture atelic and telic interpretation of the *niru* type of verb. In (46), the verb *niru*, 'simmer' has the semantic predicate ACT ON at the level of TS. In this level the verb does not contain the meaning of resultative state of being cooked. The delimited time adverbial like *10-pun-de* 'in ten minutes' or the nondelimited phrase like *10-pun-kan* 'for ten minutes' mainly refers to this semantic level. If the values in TS do not coincide with the expression, then they refer to NTS and make a coerced interpretation (Hidaka, 2011, 39). The lower acceptability of cooccurrence with a delimited time adverbial element such as *de* 'in' is that the phrase has to refer to an indirect semantic level since there is no truth-conditional value of resultative state in TS.

(46)
$$\left[\begin{array}{l} \textit{ni(ru)}\ \text{(simmer) 煮る} \\ \left[\left[\begin{array}{l} \text{Qualia} \left[\begin{array}{l} \text{TS} = \left[\begin{array}{l} \text{FORMAL: process} \\ \text{CONST: ACT ON } (x, y) \end{array}\right] \\ \text{NTS} = \left[\text{TELIC : BE } (y, \text{COOKED})\right] \end{array}\right] \end{array}\right]\right] \end{array}\right]$$
(Hidaka, 2011, 37: (50))

Further supporting evidence for assuming propositions in NTS is that the verbs like *niru* can

cancel the meaning of the resultative state as in (47). A similar type of verb such as *tsubus(u)* or *kowas(u)* cannot cancel the sense of resultative state as in (48).

(47) Sono-sakana-o ni-ta-kedo nie-na-katta
the-fish-ACC simmer-PAST-but simmer-NEG-PAST
'I simmered the fish, but it did not become edible.'
その魚を煮たけど煮えなかった。
(Hidaka, 2011, 40: (54a))

(48) a. *Sono-hako-o tsubushi-ta-kedo tsubure-na-katta
the-box-ACC crush-PAST-but crush-NEG-PAST
'I crushed the box, but it did not crush.'
その箱を潰したけど潰れなかった。

b. *Sono-pasokon-o kowashi-ta-kedo koware-nak-atta
the-personal computer-ACC break-PAST-but break-NEG-PAST
'I broke the personal computer, but it did not break.
*そのパソコンを壊したけど壊れなかった。
(Hidaka, 2011, 40: (53))

Hidaka (2011) also claims that AGENT is determined by whether or not external factors are necessary for the verbs. He defines the verbs which indicate externally caused factors as TRIGGER with plus (+) whereas those which indicate internally caused factors as the quale with minus (−). As shown in the (49) and (50), his claims are attested to by the cooccurrence of the phrases of *mizukara* or *hitorideni*, both of which are roughly translated into 'by oneself' in English. These phrase can denote an "internal factor" of the subject of a verb in a sentence.

(49) a. Ken-wa mizukara zimen-ni taore-ta [TRIGGER: -]
Ken-TOP by-himself ground-LOC fall-PAST
'Ken fell on the ground by himself.'
ケンは自ら地面に倒れた。

b. *Ken-wa mizukara tsukare-ta [TRIGGER: +]
Ken-TOP by-himself get.tired-PAST
'Ken got tired by himself.'
*ケンは自ら疲れた。
(Hidaka, 2011, 41: (55))

(50) a. sono-ha-wa hitorideni ochi-ta [TRIGGER: -]
the-leafe-TOP by.itself fall-PAST
'The leaf fell by itself.'
その葉ひとりでに落ちた。

b. *sono-nizakana-wa hitorideni kuzure-ta [TRIGGER: +]
the-simmered.fish-TOP by.itself crumble.mushy-PAST
'The simmered fish crumbled by itself.'
*その煮魚はひとりでに崩れた。
(Hidaka, 2011, 41: (56a, b))

This definition of AGENT can neatly capture externally caused eventuality in the sense of Levin and Rappaport Hovav (1995) or the Agentive role Pustejovsky defines.

2.3.3 BECOME and Telicity

Hidaka claims that the *niru*-type of verb contains a result state in NTS. He presents the compatibility with both nondelimited and delimited temporal adverbial phrases to indicate the telicity of a verb. The notion of telicity is usually represented with the semantic predicate BECOME.

In addition to *niru*-type verbs, many of the achievement verbs also entail a sense of change of state as in (51), which denote telic aspect. It cannot be compatible with *for*-phrases such as 'for a couple of hours,' either. This type of verb such as *hieru*, or *atatamaru* is equivalent to 'come to be cool' or 'come to be hot,' respectively. This semantic aspect can be represented with BECOME predicate. However, these verbs involve a presupposition of accompanying the process of the change of state.

(51) a. Kinzoku-ga {suujikan-de / *suujikan-no-aida} hie-ta.
metal-NOM a.couple.of.hour-in / a.couple.of.hour-GEN-for cool-PAST
'Metals cooled in a couple of hours.'
金属が { 数時間で / *数時間の間 } 冷えた。

b. Suupu-ga {10-pun-de / *10-pun-no-aida} atatamat-ta.
soup-NOM 10-minute-in / 10-minute-GEN-for get.hot-PAST
'The soup got hot in 10 minutes.'
スープが {10 分で / *10 分の間 } 温まった。

As shown in (51), the Japanese verb *hieru* is not compatible with *for*-phrase unlike its English counterpart, 'cool,' which allow a durational adverb like *for*-phrase (Kageyama, 1996, 61). Some achievement verbs in English like 'cool' have cardinality despite of the fact that they have inchoative

meanings. These verbs can still be represented with BECOME predicate while Jackendoff (1990, 95) adopts the semantic predicate GO to represent a sense of change of state as in (52). He explains that the sentence (52a) means that the metal is getting cooler and cooler. In short, the verb basically expresses a change over time and not an instantaneous event.

(52) a. The metal cooled for hours. (Jackendoff, 1990, 95: (23b))

b. [GO ([METAL], [TO ([COOL])]) (Kageyama, 1996, 60: (30))

However, Dowty (1979) and others admit it and adopt BECOME to represent a change of state entailments of the verbs such as 'cool.' Instead of the semantic predicate GO proposed by Jackendoff, the LCS of *cool* in the sentence like *Metlas cooled for hours* is generally represented with BECOME as in (53).

(53) [BECOME ([METAL], [BE-AT ([COOL])])]

Although many of change of state verbs in Japanese contain the semantic predicate BECOME, which is responsible for a limited time adverbial, they are also compatible with the durative expression of *for*-phrase as in (54) when they are used in transitive forms (Kageyama, 1996, 62). In these cases, the semantic predicate CAUSE is contained in the meanings of verbs along with BECOME. Kageyama claims that the CAUSE predicate has something to do with the cooccurrence of the durative phrase with these verbs. On the other hand, we have a different perspective from his on this matter. In our understanding, we believe the semantic predicate ACT plays a key role in the acceptability of the durative expression. The transitive form of the following verbs like *atatameru* or *samasu* also contains the semantic predicate of ACT (ON).

(54) a. Suupu-o 5-6-pun-kan atatameru
soup-ACC 5-6-minute-for heat
'I heat the soup for 5 to 6 minutes.'
スープを 5、6 分間温める。

b. Yaketa kinzoku-o 10-pun-kan hodo samasu
burned metal-ACC 10-minute-for about cool
'I cool the burned metal for 10 minutes.'
焼けた金属を 10 分間ほど冷ます。

c. Daikon-o 30-pun-kan hodo yowabi-de ni-ta.
radish-ACC 30-minute-for about low.flame-with simmer-PAST
'I simmered radish gently for 5 minutes.'

大根を 30 分間ほど弱火で煮た。

(Kageyama, 1996, 62: (35))

Following the idea of Kageyama, the LCS of these three verbs in (54) can be illustrated as in (55). These three verbs contain the semantic predicate ACT ON, which denotes a sense of manner or activity. This predicate establishes the relationship with the durative expression. As one of the supporting evidences that these three verbs contain BECOME, they can also cooccur with the phrase *-tearu* like in an expression *suupu-o atatame-tearu*, 'the soup has been warmed' or an expression *yaketa kinzoku-o samashi-tearu*, 'the burned metal has been cooled.'

(55) a. *atatameru*: [*x* ACT ON *y*] CAUSE [BECOME [*y* BE AT ([*WARM*])]]

b. *samasu*: [*x* ACT ON *y*] CAUSE [BECOME [*y* BE AT ([*COOL*])]]

c. *niru*: [*x* ACT ON *y*] CAUSE [BECOME [*y* BE AT ([*SIMMERED*])]]

In sum, the change of sate verbs such as *sameru* 'cool' differ from the verbs with imperfective aspects such as activity verbs. The change of location verbs also differ from those verbs with imperfective aspects such as manner of motion verbs. The verbs with a sense of change contain the BECOME predicate, which entails telic aspect. In our semantic representation, we adopt BECOME to denote aspect of telicity meanwhile we use ACT (ON) to denote aspect of atelic.

2.3.4 Change of State Verbs: Creation and Transformation

With this much in mind, we now briefly look into some of the change of state verbs discussed in the later chapters. Some of those verbs are discussed in the literature by Hidaka (2011), but others behave slightly differently. Japanese has some change of state verbs that can shift their meanings between the two senses: a sense of creation and transformation. For example, the verbs such as *horu*, 'carve' or *amu*, 'knit' can alternate their objects between products and raw materials through which the products are brought about as in (156) and (57).

(56) *horu* (carve) 彫る

a. Ken-wa sono-ki-o hotta
Ken-TOP the-tree-acc carve-PAST
'Ken carved the wood.'
ケンは その木を彫った。

b. Ken-wa sono-butsuzoo-o hotta
Ken-TOP the-Buddha.statue-ACC curve-PAST
'Ken caved the statue of Buddha'
ケンは その仏像を彫った。

(57) *amu* (knit) 編む

a. Aiko-wa sono-keito-o anda
Aiko-TOP the-wool.yarn-ACC knit-PAST
'Aiko knitted the wool yarn.'
アイコは その毛糸を編んだ。

b. Aiko-wa sono-seetaa-o anda.
Aiko-TOP the-sweater-ACC knit-PAST
'Aiko knitted the sweater.'
アイコは そのセーターを編んだ。

In both (156) and (57), the (a) sentences behave slightly differently from the (b) sentences. This type of verb basically describes the transformation of an entity from one form to another as in the (a) cases of the above examples. Like the *niru* type of verb in the previous section, this *horu* type of verb can be compatible with the durative *for*-phrase such as *10-pun (no aida)*, 'for ten minutes' as in (58) as well as nondurative *in*-phrase like *10-pun-de* as in (59), which may have slightly lower acceptability.

(58) a. Ken-wa sono-ki-o 10-pun(-no aida) hotta.
Ken-TOP the-wood-ACC 10-minute-for carve-PAST
'Ken carved the wood for 10 minutes.'
ケンはその木を 10 分（の間）彫った。

b. Aiko-wa sono-keito-o 10-pun(-no-aida) anda.
Aiko-TOP the-wool.yarn-ACC 10-minute-for knit-PAST
'Aiko knitted the wool yarn for 10 minutes.'
アイコはその毛糸を 10 分（の間）編んだ。

(59) a. ?Ken-wa sono-ki-o 10-pun-de hotta.
Ken-TOP the-wood-ACC 10-minute-in carve-PAST
'Ken carved the wood in 10 minutes.'
?ケンはその木を 10 分で彫った。

b. ?Aiko-wa sono-keito-o 10-pun-de anda.
Aiko-TOP the-wool.yarn-ACC 10-minute-in knit-PAST
'Aiko knitted the wool yarn in 10 minutes.'
?アイコはその毛糸を 10 分で編んだ。

However, the acceptability with the nondurative *in*-phrase improves when *horu* and *amu* take the object noun phrases that describe some kind of products as in the (b) sentences of (60) and (61). In that case, the acceptability with the durative *for*-phrase gets slightly lower as in the (a) sentences.

(60) a. ?Ken-wa sono-butsuzoo-o 10-pun-no-aida hotta.
Ken-TOP the-Buddha.statue-ACC 10-minute-GEN-for carve-PAST
'Ken carved the Buddha statue for 10 minutes.'
?ケンはその仏像を 10 分の間彫った。

b. Ken-wa sono-butsuzoo-o 10-pun-de hotta.
Ken-TOP the-Buddha.statue-ACC 10-minute-in carve-PAST
'Ken carved the Buddha statue in 10 minutes.'
ケンはその仏像を 10 分で彫った。

(61) a. ?Aiko-wa sono-seetaa-o 10-pun-no-aida anda.
Aiko-TOP the-sweater-ACC 10-minute-GEN-for knit-PAST
'Aiko knitted the sweater for 10 minutes.'
?アイコはそのセーターを 10 分の間編んだ。

b. Aiko-wa sono-seetaa-o 1-kagetsu-no-aida-de anda.
Aiko-TOP the-sweater-ACC 1-month-in knit-PAST
'Aiko knitted the sweater in a month.'
アイコはそのセーターを 1ヵ月の間で編んだ。

Unlike the *niru* type of verb, these two verbs can take two types of noun phrases: one that describes raw material such as *ki*, 'wood' or *keito*, 'wool yarn' and the other that describes a product such as *butsuzoo*, 'statue of Buddha' or *seetaa*, 'sweater.'

Considering these observation and the aspectual behaviors of the verb *niru*, it is assumed that the *horu*-type of verb with transformation sense can contain telic information in non-truth conditional level. Such semantic information of the verb can be captured adequately with the modified version of the qualia structure as in (62), which we discuss thoroughly in Chapter 4.

(62)
$$\begin{bmatrix} \text{horu with transformation sense (carve) 彫る} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \left[\text{CONST: ACT-ON } (x, y)\right] \\ \text{NTS} = \left[\text{TELIC: } \exists z \text{BECOME (BE-AT } (y, z))\right] \end{bmatrix} \end{bmatrix}$$

In contrast to the verb *horu* with transformation sense in the (a) sentence of (156), *horu* with creation sense in the (b) sentence contains telic information in truth-conditional level. The sentence cannot cancel the sense of resultative state as the verbs *tsubus(u)* and *kowas(u)* in (48). The lexical semantic representation of the verb *horu* with creation sense is represented as in (63). See also Chapter 4 for further details on the discussion.

(63)
$$\begin{bmatrix} \text{horu with creation sense (carve) 彫る} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } z \text{ (physical object: a product)} \\ \text{D-ARG1: } y \end{bmatrix} \\ \text{QUALIA} = \Big[\text{TS} = \Big[\text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, z))\Big]\Big] \end{bmatrix}$$

The verbs that have senses of creation and transformation may be different from those verbs with only transformation sense or with only creation sense. We will focus more closely on these verbs in later chapters as well.

2.4 Summary

We have briefly shown the basic ideas of LCS and GL as well as how these theoretical devices work. Finally we have presented our theoretical tool for our analysis in the dissertation. The modified version of qualia structure with the two sections, TS and NTS can be effective when we need to capture non-propositional but lexically incorporated meaning of verbs. As we will discuss intensively some of such verbs, i.e., change of state verbs, which is similar to the *niru*-type verbs exemplified in the previous section, in the following chapters, it is very critical to be able to represent variables in the non-truth conditional level.

Chapter 3 The Change Relative Revisited

3.1 Introducdtion

In this chapter, we make a review of some of the approaches to the Japanese relative clauses, especially two kinds. One of them is the so-called Change Relatives (Tonosaki, 1998) and the other is the Head-Internal Relative Clauses. The latter relative clauses have been studied by various researchers. There have been a number of theoretical explanations in terms of semantics, pragmatics as well as syntax. However, there have been fewer such theoretical approaches to the former relative clauses. In this dissertation, we will make a theoretical analysis of Change Relatives with the help of the lexical semantic devices introduced in Chapter 2.

As a first step, we introduce the most well-known research on Change Relatives and summarize some distinctive characteristics of this relative clauses. Then, we briefly look over some of the most widely accepted approaches to Head-Internal Relative Clauses and suggest an assumption based on those previous approaches. Considering the assumption of Head-Internal Relative Clauses that we rest on, we propose a new approach to Change Relatives, by clarifying our research question that the previous study contains. We finally give our objectives to our research question in the dissertation.

The organization of the chapter is as follows. Section 3.2 introduces previous studies on Change Relatives and explains the distinctive characteristics of the relative clauses. In Section 3.3 we explain some of the previous studies on Head-Internal Relative Clauses, and we present one of the recent approaches in the following section, which we take as a basis for our assumption. In Section 3.5, we point out some problems that the two relative clauses have. We suggest that a certain semantic element of a verb can be a key element to distinguish the interpretation of the two relative clauses.

3.2 Change Relatives

Japanese has different of types of relative clauses such as 'Head-External Relative Clauses (HERCs),' 'Head-Internal Relative Clauses (HIRCs),' and so on. Among others, Hoshi (1995), Matsumoto (1989), and others propose another type of relative clause, which Tonosaki (1998) calls 'Change Relatives (CRs).' Some researchers cast doubt about the existence of such a relative clause. Kuroda (1992b) and Hiraiwa (2012) consider it to be a kind of HERC whereas Grosu and Hoshi (2016) regard it as a kind of HIRC. Whether or not the CR is an HIRC is not an easy issue to be solved unless we define what a CR is. In this section, we first look through the previous studies on CRs,

and then define the characteristics of the relative clause for further theoretical analysis.

Following Matsumoto (1989) and Hoshi (1995), Tonosaki (1998) has done the thorough research on CRs for the first time. She points out that a CR behaves syntactically differently from an HIRC even though they are very much alike on the surface. She clarifies one of the differences between the two kinds of relative clauses by testing the post-relative *no* with some criterion for pronominal. Another crucial difference is the semantic natures of these kinds of relative clauses. She claims that the internal head of a CR undergoes some property change but that of an HIRC does not.

3.2.1 The Status of the Post-Relative *no*

Tonosaki (1998) argues that a CR behaves differently from an HIRC in terms of syntactic point of view even though their surface strings are almost indistinguishable. The most critical syntactic difference is the status of the post-relative *no* of a CR compared with that of an HIRC. The post-relative *no* of the CR can be replaced with a light noun such as *yatsu*, 'thing' as in (64) whereas that of the HIRC cannot as in (65). The *no* in the latter clause has been claimed to be a nominalizing complementizer, hereinafter referred to as a 'complementizer.' The *no* in the former is considered to be a pronominal.

(64) CR:

[Otamajakushi-ga kaeru-ni nat-ta] {no / *yatsu*}]-ga niwa-o hane-te-iru.
tadpole-NOM frog-COP become-PAST no / thing-NOM yard-ACC hop-COP-PROG

'A frog that is the result of changing from a tadpole is hopping in the yard.'
オタマジャクシが蛙になった { の / やつ } が庭を跳ねている。
(Tonosaki, 1998, 144: (2c))

(65) HIRC:

*John-wa [[Mary-ga *ringo-o* mot-te ki-ta] {no / *yatsu*}]-o tot-te
John-TOP Mary-NOM apple-ACC bring-COP come-PAST No / thing-ACC pick.up-COP
tabe-ta.
eat-PAST

'John picked up the apple which Mary brought and ate it.'
*ジョンはメアリーがリンゴを持ってきた { の / やつ } を取って食べた。
(Tonosaki, 1998, 144: (1c))

One of the factors which the post-relative *no* is claimed to be a pronominal can be referred back to the arguments made by Kuroda (1992b). He argues that the pronominal *no* is generally

replaceable with its explicit or implicit-equivalent antecedent (Kuroda, 1992b, 159), which is shown in (66).

(66) Asoko-ni aru ringo-wa aokute, koko-ni aru {no / ringo}-wa akai.
(over-)there-LOC be apple-TOP green here-LOC be {thing / apple-TOP} red
'The apple which is there is green, and the one here is red.'
あそこにあるリンゴは 青くて、ここにある {の / リンゴ} は赤い。
(Kuroda, 1992b, 159: (8))

However, the *no* of the HIRC in (67) cannot be replaced by its antecedent, *ringo*, 'apple' as Kuroda insists. Furthermore, a pronominal *no* cannot refer to an honorable human referent as shown in (68a). In contrast, the *no* of the HIRC can refer to an honorable human referent as in (68b).

(67) Watashi-wa [[aoi ringo-ga sara-no-ue-ni aru] {no / *ringo}]-o tot-te
I-TOP green apple-NOM plate-GEN-on-LOC be {thing / apple}-ACC pick.up-COP
tabe-ta.
eat-PAST
'I picked up a green apple which was on the plate and ate it.'
私は青いリンゴが皿の上にある { の / *リンゴ } をとって食べた。

(68) a. Go-toochaku-ni nat-ta {*no / sensei}-o kaijoo-made
HONOR-arrive-COP be-PAST {thing / professor}-ACC (meeting.)venue-to
o-tsure-shi-ta.
HONOR-take-be-PAST
'I took a professor who had arrived to the (meeting) venue.'
ご到着になった {*の / 先生 } を 会場までお連した。
(Mihara & Hiraiwa, 2006, 162: (21b))

b. [sensei-ga kenkyushitsu-de hon-no-seiri-o
professor-NOM research.room-at book-GEN-sorting.out-ACC
nasat-te-i-ta] no-ga, tsumazukare-te kega-o
HONOR.be-COP-be-PAST No-NOM trip.over.HONOR-COP injury-ACC
sare-ta.
be.HONOR-PAST
'The professor who had sorted out his books at his research room tripped over and got injured.'
先生が研究室で本の整理をなさっていたのが、躓かれて怪我をされた。
(Mihara & Hiraiwa, 2006, 162: (21c))

Another factor of distinguishing the pronominal *no* from other *no* is that the pronominal can have a modifier before it. Based on this fact, the *no* of CRs can have a prenominal modifier as Tonosaki (1998) points out in (70a). The *no* of HIRCs cannot have a modifier such as *akai*, 'red' before it as shown in (69). The same thing can also be detected in a normal relative clause with the pronominal *no* as the head noun in (70b) (Mihara & Hiraiwa, 2006). In that respect, the *no* of CRs is considered to be a pronominal whereas that of HIRCs is not.

(69) HIRC:

a. John-wa [[Mary-ga ringo-o tsukue-no-ue-ni oi-ta] no]-o
John-TOP Mary-NOM apple-ACC desk-GEN-on-LOC put-PAST No-ACC
tot-ta.
pick.up-PAST
'John picked up the apple which Mary put on the desk.'
ジョンはメアリーがリンゴを机の上に置いたのを取った。
(Tonosaki, 1998, 147: (9a))

b. *John-wa [[Mary-ga ringo-o tsukue-no-ue-ni oi-ta] *akai* no]-o
John-TOP Mary-NOM apple-ACC desk-GEN-on-LOC put-PAST red one-ACC
tot-ta.
pick.up-PAST
'John picked up the red apple which Mary put on the desk.'
*ジョンはメアリーがリンゴを机の上に置いた赤いのを取った。
(Tonosaki, 1998, 147: (9b))

(70) a. CR:

John-wa [[kurozatoo-o tokashi-ta] *torotto-shi-ta* no]-o dango-ni
John-TOP brown.sugar-ACC melt-PAST sticky-be-PAST no-ACC dumpling-DAT
tsuke-ta.
put-PAST
'John put the sticky black syrup which was made by melting brown sugar on the dumplings.'
ジョンは黒砂糖を溶かしたとろっとしたのを団子につけた。
(Tonosaki, 1998, 150: (22b))

b. HERC:

Tetsuya-wa [Lisa-ga mui-te-kure-ta] *oishisona* {no / ringo}-o
Tetsuya-TOP Lisa-NOM peel-COP-PASS-PAST delicious.looking {one / apple}-ACC
tabe-ta.
eat-PAST

'Tetsuya ate the delicious one (apple) which Lisa had peeled.'
(Mihara & Hiraiwa, 2006, 161: (22a))
哲也は 理沙が剥いてくれたおいしそうな { の / リンゴ } を 食べた。

As shown above, the *no* of CRs is regarded as a pronominal whereas that of HIRCs as a complementizer. There has been much discussion on the status of the *no* of HIRCs; however, this *no* is not a pronominal. We simply consider it as a complementizer hereinafter as Kuroda (1992b) did.

3.2.2 The Semantic Properties of Change-Relatives

Along with the difference in the status of the post-relative *no* between the two relative clauses CR and HIRC, the other distinct characteristic is the semantic property of the CR. Tonosaki (1998) argues that the internal head of a CR undergoes some property changes. What does a 'property change' mean in her sense? Let us compare (71) and (72). (71a) and (72a) are almost the same except for the embedded verb. In this regard these two relative clauses behave quite differently. The former exhibits the characteristics of a CR while the latter shows the typical nature of an HIRC as shown in (71b), (72b) respectively.

In (71) the verb *wakasu*, 'boil,' in the relative clause indicates that the internal head *mineraru wootaa*, 'mineral water,' changes from cold to hot as a result of the act of boiling. Then the internal head is interpreted as hot water. This interpretation of the internal head behaves as an argument of the main verb in the matrix clause. When the internal head of the relative clause changes its meaning and gets a new interpretation as shown in this example, the post-relative *no* can be replaced with a pronominal such as *yatsu* or *mono*. Such a relative clause is regarded as a CR.

(71) CR:

a. Mary-wa [[mineraru-wootaa-o wakashi-ta] no]-o non-da.
Mary-TOP mineral.water-ACC boil-PAST no-ACC drink-PAST
'Mary drank the mineral water which had been boiled.'
メアリーはミネラルウォーターを沸かしたのを飲んだ。
(Tonosaki, 1998, 152: (30a))

b. Mary-wa [[mineraru-wootaa-o wakashi-ta] {*yatu*/ *mono*}]-o non-da.
Mary-TOP mineral.water-ACC boil-PAST {one/ thing}-ACC drink-PAST
'Mary drank the mineral water which had been boiled.'
メアリーはミネラルウォーターを沸かしたやつを飲んだ。
(Tonosaki, 1998, 152: (30b))

On the other hand, the verb *kau*, 'buy,' in the relative clause of (72) does not give any sense of changes to the internal head through the act of buying. The argument of the main verb in the

matrix clause is still interpreted as the mineral water as it is in the relative clause. The post-relative *no* cannot be replaced with a pronominal phrase such as *yatsu*. This type of the relative clause is regarded as an HIRC.

(72) HIRC:

a. Mary-wa [mineraru-wootaa-o kat-ta no]-o non-da.
Mary-TOP mineral.water-ACC buy-PAST No-ACC drink-PAST
'Mary drank the mineral water which she had bought.'
メアリーはミネラルウォーターを買ったのを飲んだ。

b. *Mary-wa [mineraru-waataa-o kat-ta {*yatu / mono*}]-o non-da.
Mary-TOP mineral.water-ACC buy-PAST {one / thing}-ACC drink-PAST
'Mary drank the mineral water which she had bought.'
*メアリーはミネラルウォーター を買った{ やつ / もの } を飲んだ。

In summary, there are two distinctive differences between CRs and HIRCs. One is the status of the post-relative *no*: whether the *no* behaves as a pronominal or not. The other difference is the semantic property of the internal heads in the two relative clauses. The internal head in a CR acquires a new sense of meaning when it combines with a certain type of verb which occurs in the relative clauses whereas that of an HIRC does not.

In the following section, we will briefly introduce some of the previous studies on HIRCs which have been discussed and researched by various number of researchers.

3.3 Head-Internal Relative Clauses

HIRCs have been discussed and analyzed in many papers compared with CRs. It has been assumed in previous literature that the construction of the so-called HIRC as in (72) and (74) is subject to a number of constraints relating to syntax, semantics, and pragmatic factors. Among such constraints and restrictions, the most well-known constraint on HIRCs is the "Relevancy Condition," which is defined by Kuroda (1992b). He argues that HIRCs have to satisfy a specific condition to be acceptable, which he stipulates as the following constraint.

(73) THE RELEVANCY CONDITION: For an HIRC[1] to be acceptable, it is necessary that it be interpreted pragmatically in such a way as to be directly relevant to the pragmatic content of its matrix clause.

For instance, when we compare the two sentences, (a) and (b) in (74), there arises the difference in accepting them from the pragmatic point of view. It is assumed that the acceptability of (74b)

[1]Kuroda (1992b) first calls the HIRC as a pivot-independent relative clause.

is lower than that of (74a). The lower acceptability of (74b) is probably based on the temporal difference between the eventuality denoted by the matrix clause and the one denoted by the HIRC. However, some Japanese native speakers may accept the sentence of (74b) without any problems despite the temporal differences exist between the embedded clause and the matrix clause, which is considered to be part of the Relevancy Condition. As shown in these two examples, Kuroda's condition itself cannot clearly explain the variability in the acceptability of the sentence (74b). Kuroda's Relevance Condition may explain the core property of HIRCs, but there seem to remain unclear contents in the Condition. Various researchers have been examining and attempting to modify Kuroda's Relevancy Condition to make it more refined constraint.

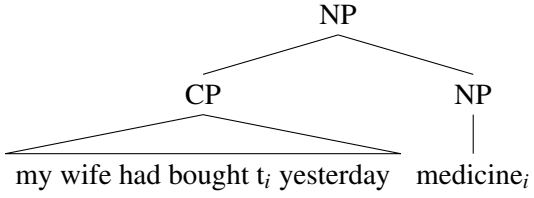
(74) a. Watashi-wa [kanai-ga kinoo, kusuri-o
I-TOP my.wife-NOM yesterday, medicine-ACC
kat-te-oi-te-kure-ta no]-o kesa non-da.
buy-COP-have-COP-PASS-PAST] No-ACC this.morning take-PAST
'I took the medicine which my wife had bought yesterday this morning.'
私は家内が昨日、薬を買っておいてくれたのを今朝飲んだ。

b. #Watashi-wa [kanai-ga kinoo, kusuri-o kat-ta no]-o
I-TOP my.wife-NOM yesterday medicine-ACC buy-PAST No-ACC
kesa non-da.
this.morning take-PAST
'I took the medicine which my wife bought yesterday this morning.'
#私は家内が昨日、薬を買ったのを今朝飲んだ。

(Mihara & Hiraiwa, 2006, 154: (4))

Besides Kuroda's Relevancy Condition, the second most well-known approach to HIRCs is the LF head raising analysis, in which an HIRC is regarded as a type of the regular relative clauses. Under the LF raising approach, the construction of the relative clause looks like (75) under the surface. The internal head undergoes raising at the level of LF, and the head goes into the position of an NP in the matrix clause.

(75)



The head raising analysis is proposed by Itô (1986) for Japanese and others for many other languages such as Choctaw (Broadwell, 1987) or Quechua (Cole, 1987). While the landing sites

slightly vary among literature, the position is regarded as external to the relative clause which contains the head. Under this analysis the LF representation of an HIRC is similar to that of an HERC.

However, there arise some problems under this analysis. As one of the counterarguments, Basilico (1996) claims that the internal heads of HIRCs in some languages will not move out of the relative clauses. He presents a number of data of HIRCs from some dialects of Diegueño. According to him, if the sentence in (76) from Diegueño is derived from the head movement, which is assumed to locate external to the clause at LF, the head would receive the case marking which matches with its role in the matrix clause, as well as the definite marking in those cases where the NP is definite (Basilico, 1996, 505).

(76) ’wi^{y} ’xat(-0) ni^{y}i-m ’tu:pu-c n^{y}iL^{y}cis
rock dog(-OBJ) that-COMIT I.hit-DEM-SUBJ black.indeed
‘The rock that I hit the dog with was black.’
(Basilico, 1996, 501: (5))

He observes that the internal head cannot bear the definite marker *pu* or the subject marker *-c* as shown in (77) even though it functions as the subject of the predicate *n^{y}iL^{y}cis*, ‘is black,’ in the matrix clause.

(77) a. *wil^{y}-pu ’xaṭ(-0) n^{y}i-m ?tu:-pu-c n^{y}iL^{y}cis.
rock+DEM dog-OBJ that-COMIT I.hit-DEM-SUBJ black.indeed

b. *wil^{y}-pu-c ’xaṭ-0 n^{y}i-m ?tu:pu-c n^{y}iL^{y}cis.
rock-DEM-SUBJ dog-OBJ that -COMIT I.hit-DEM-SUBJ black.indeed
(Basilico, 1996, 505: (17))

Hoshi (1995) and Shimoyama (1999) claim that the internal heads of HIRCs in Japanese also remain internal and that HIRCs and HERCs do not share the same truth-conditions. They even assume that HIRCs may have some similar elements as the E-type pronouns, considering the nature of HIRCs. Following their E-type pronoun approach, Nishigauchi (2004) examines the semantic property of HIRCs and argues that the internal argument of a verb embedded in the relative clause, i.e. the internal head, has a certain semantic property, a theme role. Shimoyama (2001) and Grosu and Hoshi (2016) make similar observations in the respect that the theme role in the relative clause is involved in the determination of the internal head of HIRCs.

In this dissertation, we will be in the same position as Hoshi, Basilico, Shimoyama and Nishigauchi. We assume that the internal heads of HIRCs remain inside the clauses, in particular, for Japanese. We now closely look into the ideas of Hoshi, Shimoyama and Nishigauchi and briefly explain about their ways of analyzing HIRCs in the following sections.

3.3.1 The Internal Head Remains Internal

Hoshi (1995) and Shimoyama (1999) suggest that the interpretation of an HIRC construction in Japanese is related with an E-type anaphora. They assume that the scope of quantified expressions occurred in the HIRC remains inside the clause by using the widely accepted notion of the relative scope of quantifiers in Japanese. It is generally assumed that the relative scope of quantifier is determined by the c-command relationship in the surface structure as shown in (78). As Shimoyama briefly demonstrates the mechanism for the interpretation of the relative scope of quantifiers in Japanese as in (78a), the quantifier *hotondo*, 'most' takes a wide scope as a surface order represents. The quantifier *dono*, 'each' in (78b) takes a wide scope in contrast to (78a). Even if (78b) is a variant of (78a) by the head raising, the scope of *hotondo* cannot take a wide scope over *dono*.

(78) a. Hotondo-no gakusei-ga dono shukudai-mo teishutsushi-ta.
most-GEN student-NOM every homework turn.in-PAST
'Most students turned in every homework.'
ほとんどの学生がどの宿題も提出した。
(i) Most > ∀ (ii) * ∀ > Most
(Shimoyama, 1999, 151: (6a))

b. Dono shukudai-mo hotondo-no gakusei-ga t_i teishutsushi-ta.
every homework most-GEN student-NOM turn.in-PAST
'Every homework, most students turned in.'
どの宿題もほとんどの学生が提出した。
(i) *Most > ∀ (ii) ∀ > Most
(Shimoyama, 1999, 151:(6b))

With these points in mind, we now look into the analysis of interpretation of HIRC constructions by Shimoyama. Under the LF head raising analysis, the HIRC should have the same structure as an HERC because the internal head of the HIRC raises to the external position of the noun phrase in the matrix clause. In this sense, the sentences in (79a) and (79b) are supposed to have the same readings. However, Shimoyama observes that the interpretations of these two sentences differ from each other. For example, in (79a), the numeral quantifier *30-ko*, 'thirty' takes a narrow scope which is restricted by the cookies within the relative clause. The sentence reads as the number of cookies that Yoko put into the refrigerator was exactly thirty, and she brought all the thirty cookies to the party. On the other hand, in the case of (79b), the scope of the numeral *30-ko* is restricted by the relative clause of 'Yoko put (x) in the refrigerator' along with the external head, 'cookies' in the matrix clause. The sentence of (79b) reads as Yoko brought only thirty cookies to the party but she

might put more cookies into the refrigerator. In this case, the truth condition of the sentence in (79b) still holds true.

(79) a. HIRC

Taro-wa [[Yoko-ga reizooko-ni kukkii-o 30-ko ire-te-oi-ta]
Taro-TOP Yoko-NOM refrigerator-LOC cookie-ACC thirty put-COP-have-PAST
no]-o paatii-ni mot-te it-ta.
No-ACC party-to bring-COP go-PAST

'Yoko put the thirty cookies in the refrigerator and Taro brought (all of) them to the party.'
太郎は洋子が冷蔵庫にクッキーを30個いれておいたのをパーティーに持って行った。

b. HERC

Taro-wa [[Yoko-ga reizooko-ni ϕ ire-te-oi-ta] cookii]-o 30-ko
Taro-TOP Yoko-NOM refrigerator-LOC put-COP-have-PAST cookie-ACC thirty
paatii-ni mot-te it-ta.
party-to bring-COP go-PAST

'Taro brought thirty cookies that Yoko had put in the refrigerator to the party.'
太郎は洋子が冷蔵庫にいれておいたクッキーを30個 パーティーに持って行った。

In other words, the numeral quantifier 'thirty' can bind the noun phrase 'cookies' at the level of LF under the LF head raising analysis. The LF of (79a) should be reduced to be that of (79b) in its scope and meaning if the quantified internal head of *kukkii-o 30-ko*, 'thirty cookies' are located in the external head position at LF. The meanings of the two sentences (a) and (b) in (79) are actually different from each other. This difference of the truth condition between (79a) and (79b) leads to the contradictory hypothesis that the internal head remains inside the HIRC clause (Shimoyama, 1999, 149-150).

She further demonstrates the evidence that the internal head remains inside the HIRC with quantificational internal heads as in (80). When the sentence (78a) is embedded in the HIRC as in (80a), the scope pattern of the quantifier remains the same. *Hotondo* takes a wide scope over *dono*. When a object is scrambled within the HIRC as in the (80b), the scope pattern is also comparable to the one in the (78b), in which *dono* takes a wide scope over *hotondo*.

(80) a. Taro-wa [[hotondo-no gakusei-ga dono shukudai-mo teishutsushi-ta] -no]-o
Taro-TOP most-GEN student-NOM every homework turn.in-PAST -NM-ACC
yatto saitenshioe-ta.
finally finish.grading-PAST

'Most students turned in every homework and Taro finally finished grading them.'
太郎はほとんどの学生がどの宿題も提出したのをやっと採点しおえた。

b. Taro-wa [[dono shukudai-mo hotondo-no gakusei-ga t_i teishutsushi-ta]
Taro-TOP every homework most-GEN student-NOM turn.in-PAST
-no]-o yatto saitenshioe-ta.
-NM-ACC finally finish.grading-PAST
'Every homework, most students turned in and Taro finally finished grading them.' (in literal translation)
太郎はどの宿題もほとんどの学生が提出したのをやっと採点しおえた。

(Shimoyama, 1999, 154: (10))

If these two sentences are the results of the head raising of the internal head *dono shukudai-mo* at LF, they should be reduced to be their counterpart (81) in their meaning and scope possibilities. However, as Shimoyama explains, the two sentences in (80) do not hold the same meaning and scope pattern with (81).

(81) Taro-wa [[hotondo-no gakusei-ga ϕ teishutsushi-ta] dono shukudai-mo]
Taro-TOP most-GEN student-NOM turn.in-PAST every homework
saitenshioe-ta.
finish.grading-PAST
'Taro finished grading every homework that most students turned in.'
太郎はほとんどの学生が提出したどの宿題も採点しおえた。
(Shimoyama, 1999, 154: (11))

All those evidences lead her to conclude that the internal head of the HIRC remains internal with no movement in the LF. She assumes that the interpretation of the HIRC constructions will be mediated by some element in the matrix clause and that this element is somehow anaphorically related to the internal head (Shimoyama, 1999, 155). Such anaphoric relation behaves like E-type anaphora, which is similar to what Hoshi (1995) also proposes. However, Shimoyama argues Hoshi's proposal cannot capture the nature of E-type anaphora adequately. She provides some modifications on his proposal in order to capture the whole anaphoric relation.

3.3.2 E-type Anaphora Analysis

Hoshi (1995) proposes that the structure of an HIRC is headed externally by an empty argument, [*e*] in an NP of a matrix clause. He postulates that this empty argument is base generated in the specifier (Spec) of NP and that it constructs an anaphoric relationship with the matrix clause. He argues that the quantificational internal head, *san-ko-no ringo*, 'three apples' in (82) cannot extend

its scope over the [*e*] in the matrix clause so that it cannot bind the empty argument. If the scope of the numeral quantifier of 'three apples' extended over the empty argument in the matrix clause, the interpretation of the sentence would be like 'three apples are such that Mary peeled them and John ate them.' In that case, the number of apples that Mary peeled does not have to be three. The sentence would be true with a scenario in which there were five such apples that Mary peeled but John ate three of them. However, this is not the case with the sentence in (82). The sentence naturally means that Mary peeled only three apples and the number of apples that John ate was these three. He observes that this fact about the quantifier scope difference shows the similarity of E-type pronoun interpretation compared with the bound pronoun interpretation.

(82) John-wa [$_{NP}$ [$_{CP}$ [$_{IP}$ Mary-ga san-ko-no **ringo**-o muite-kure-ta]
John-TOP Mary-NOM three-CL-GEN apple-ACC peel-PASS-PAST
-no]-o [*e*]] tabe-ta.
-COMP-ACC eat-PAST
'Mary peeled three apples and John ate them all.'
ジョンはメアリーが3個のりんごを剥いてくれたのを食べた。
(Hoshi, 1995, 131: (27))

Evans (1980) argues that an E-type pronoun has a quantified expression as its antecedent and that they are not c-commanded by the antecedent. As he points out, it can refer to the members of a set induced by the quantified expression in a sentence as in (83). Hoshi (1995) assumes that the property of the empty argument, [*e*] in his proposed HIRC construction has a similar property as the pronoun *they* in (83) from Evans (1980, 339: (7)).

(83) Few congressmen admire Kennedy, and *they* are very junior. (Shimoyama, 1999, 155: (13))

In (83), the sentence means that few congressmen admire Kennedy and that all the congressmen who admire Kennedy are very junior. *They* in this sentence cannot be interpreted as a bound variable pronoun. If it is interpreted as such a variable, the sentence would mean that few congressmen are such that they admire Kennedy and are very junior.

Hoshi postulates the empty argument is placed outside of the post-relative *no* in the HIRC. He considers this empty argument as an E-type pronoun in the sense of Evans. Hoshi's approach of the empty head noun in the HIRC seems to have some problems. In fact, Shimoyama (1999, 156) claims that the empty argument [*e*] in the matrix clause of (82) still has a possibility of referring to the apples that Mary peeled, which can be a plural referent made discernible by the HIRC-clause even though it does not refer to the quantified expression *sanko-no ringo* in the first place. She explains that his approach to the interpretation of HIRCs is a kind of referential anaphora. In contrast, she assumes that there is the third kind of anaphora, which is neither bound variable nor referential

anaphora, for interpreting HIRCs. She has refined Hoshi's proposal to make it compatible with her idea of the third kind of anaphora which is involved in the interpretation of HIRCs.

Shimoyama argues that the sentence in (84) shows that the interpretation of an HIRC is related with not a referential anaphora, but an E-type anaphora. She gives the closest English paraphrase of (84) as in (85).

(84) Dono gakusei-mo$_i$ [soitsu-ga / *pro*$_i$ kongakki **peepaa-o** **3-bon**
every student s/he-NOM / pro this.semester term.paper-ACC 3-CL
kai-ta]-no]-o kesa teishutsushi-ta.
write-PAST-NM-ACC this.morning turn.in-PAST
どの学生もそいつが今学期ペーパーを *3* 本書いたのを今朝提出した。
(Shimoyama, 1999, 156: (14))

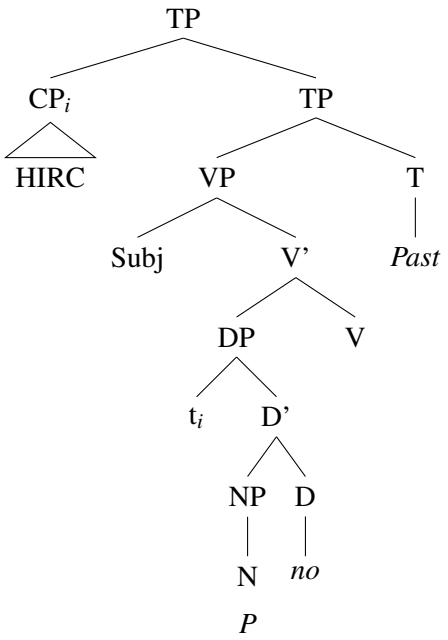
(85) Every student wrote three term papers this semester and turned in *the term papers he or she wrote this semester* this morning.
(Shimoyama, 1999, 156: (14'))

Following Shimoyama, the object in the matrix clause of (84) does not refer to any particular set of term papers, but the term papers that he or she wrote this semester. The clause contains a variable he or she which is bounded by the subject 'every student' in the matrix clause. In this way the semantic value of the object in the matrix clause is allowed to vary depending on each student. If the sentence in (84) is related with a referential anaphora, the interpretation would not be the same as (85).

After examining a couple of empirical data such as the one in the above and Hoshi (1995)'s proposal, she presents the LF representation and compositional interpretation of the HIRC, which is based on the analysis of E-type pronouns by Heim and Kratzer (1998). She postulates that the HIRC is adjoined to the matrix TP, which is base-generated in the matrix object DP under the LF, which is given in (86). She argues that the construction of an HIRC is analogous to that of a non-restrictive relative clause. In her understanding, a non-restrictive relative clause is interpreted as a separate sentence and does not compose semantically with the rest of the phrases they appear to modify (Shimoyama, 1999, 166).

In the matrix object DP in (86), the unpronounced profrom, *P*, which is a predicate that denotes an n-place property. *P* is a free variable of type $< e, t >$. The post-relative *no*, which is positioned in the head of DP, takes this proform as an argument. Shimoyama (1999) assumes that this *no* has the equal function as the English definite article, *the*. The *no* returns a maximal individual that satisfies the property denoted by the predicate *P*. The *P* receives its denotation by the assignment function in the content of the HIRC. In this way, she assumes that the HIRC act as a sentence which supplies the context to the post-relative *no* of 'proform' under her analysis.

(86)



Shimoyama (1999) claims that this structure captures the property of an E-type anaphora relations. However, Nishigauchi (2004, 115) argues that the characteristics of E-type anaphora is the result of the quantified expressions appearing in the HIRC constructions, which induce a set of nouns denoted by such quantified expressions. This kind of expressions is related with the existential implication.

3.4 Semantic Content of Head-Internal Relative Clauses

3.4.1 Nishigauchi 2004

Nishigauchi (2004) argues that the approach proposed by Hoshi (1995) and Shimoyama (1999) may be able to capture a substantial part of the constraints on the relation between the HIRC and its matrix clause. However, it cannot account for the property of the HIRC itself. He claims the following notion regarding the interpretation of HIRCs.

(87) The semantic content of an HIRC constitutes a thetic judgment, as against the categorical judgment, in the sense of Frantz Brentano. Cf. Kuroda (1992a), Ladusaw (1994), Basilico (1998) etc. (Nishigauchi, 2004, 114: (2-2))

Nishigauchi points out that one important property of an E-type pronoun is to have the condition of the existential implication when a quantificational expression serves as its antecedent. He argues this existential implication has some kind of relation with a number of factors in an HIRC along with its matrix clause.

One of the factors which relate the existential implication with an E-type pronoun and an HIRC is the incompatibility with negation. For instance, the quantified expressions with negation *no* cannot hold the truth condition for the second sentences with the E-type pronouns as in (88). As Evans (1980) argues, the pronouns in these sentences require that all the relevant objects verified by the antecedent of quantified expressions in the first sentence should satisfy the predicate in that sentence. If they don't satisfy the predicate, the antecedent sentence cannot hold the truth. When we assume that this is the role of the E-type pronouns as Evans points out, it explains the unsuccessful use of an E-type pronoun with a quantified expression of *no*.

(88) a. *No congressman admire Kennedy, and they are very junior. (Evans, 1980, 340: (13))

b. *John owns no sheep, and Harry vaccinates them in the Spring. (Evans, 1980, 340: (15))

Nishigauchi (2004, 116) observes that the incompatibility with the negation of an E-type pronoun is the similar reason for the ungrammaticality of the sentence containing an HIRC as in (89). The HIRC clause fails to establish existential implication.

(89) *[Taroo-ga ronbun-o kaka-nakat-ta no]-kara Hanako-ga inyoo-shita.
Taroo-NOM paper-ACC write-not-PAST No-from Hanako-NOM quote-PAST
'Taro didn't write *papers* and Hanako quoted from *them*.'
*太郎が論文を書かなかったのから花子が引用した。
(Nishigauchi, 2004, 116: (11))

The other factor related with the E-type pronoun is the usage of the present progressive form. As shown in (90), an E-type pronoun cannot be used in the progressive construction.

(90) *John is writing *a paper*, and Mary quoted from *it*.
(Nishigauchi, 2004, 117: (17))

Like an E-type pronoun, HIRC sentences are not acceptable when the present progressive form occurs inside the HIRC as in (91). As Nishigauchi observes, the creation verb *kak(u)*, 'write' does not ensure the existence of the paper that Taro wrote.

(91) *[Taro-ga ronbun-o kai-te-iru no]-kara Hanako-ga inyoo-shita.
Taro-NOM paper-ACC write-COP-PROG No-from Hanako-NOM quote-PAST
'Taro is writing *a paper* and Hanako quoted from *it*.'
*太郎が論文を書いているのから花子が 引用した。
(Nishigauchi, 2004, 116: (15))

However, the present progressive form of the same verb *kak(u)* can be accepted when the head NP is positioned outside the clause as in (92). In this case, the relative clause restricts semantically

the head NP in the matrix clause. Unlike an HIRC, an HERC does not semantically restrict its internal head.

(92) [Taroo-ga kai-te-iru ronbun]-kara Hanako-ga inyoo-shita.
Taroo-NOM write-COP-PROG paper-from Hanako-NOM quote-PAST
'Hanako quoted from the paper that Taro is writing.'
太郎が 書いている論文から 花子が 引用した。
(Nishigauchi, 2004, 117: (16))

Nishigauchi further argues that the use of both E-type pronoun and HIRC can be accepted when these two occur in some modal constructions as in (93) and (94), respectively.

(93) John is writing *a paper*, and Mary {*is going to / wants to / will*} quote from *it*.
(Nishigauchi, 2004, 117: (18))

(94) [Taro-ga ronbun-o kai-te-iru no]-kara Hanako-ga inyoo-shita-gatte iru.
Taro-NOM paper-ACC write-COP-PROG No-from Hanako-NOM quote-want is
'Taro is writing *a paper* and Hanako wants to quote from *it*.'
太郎が論文を書いているのから花子が引用したがっている。
(Nishigauchi, 2004, 117: (19))

Considering these observations, there seems to be a common factor between the E-type pronouns and the HIRCs: the existential implication. In that respect, Nishigauchi (2004, 118) argues that 'the interpretation and syntactic structures of HIRCs in Japanese represent a syntactic realization of thetic judgments', which is one of the two modes of judgments: the thetic judgment and the categorical judgment that are first introduced by the philosopher Franz Brentano. The thetic judgment represents the realization of an entity or an event whereas the categorical judgment first represents an entity and then predicates its property, which is a compound representation (Ladusaw, 1994, 223). These two judgment forms have been brought into the linguistic theory by Kuroda (1992a). A brief summary from Ladusaw (1994, 223) on the idea is listed below:

> The basis for a thetic judgment is a presentation of an object: an entity or eventuality. An affirmation of such a presentation commits the judger to the existence of something which satisfies the presentation; a denial by contrast expresses a negative existence judgment.
>
> The basis for a categorical judgment is compound: first a presentation which is clarified into a particular object satisfying the description, and then a property to be affirmed or denied of the object.

Nishigauchi also defines an object or entity which is involved in the thetic judgment as 'thetic focus' for discussion purpose, which is also indicated as the bold-faced expressions in (95). For instance, he claims that the objects of creation verbs such as *build* or the subjects of unaccusative verbs such as *appear* represent the notion of thetic judgment. However, these verbs cannot imply an existential implication when used in the progressive forms as in (95). In these cases, the verbs do not clearly assert the existence of the objects.

(95) a. John is building **a house** on the hill.

b. **A strange person** was appearing.

(Nishigauchi, 2004, 119: (26))

Furthermore, Nishigauchi shows the empirical data which indicates that the categorical judgment cannot form an HIRC as in (96). This construction involves a clefted sentence in the relative clause.

(96) *[Huukeiga-o kai-ta no-ga yuumei-na gaka de-aru no]-ga kazatte aru.
landscape-ACC paint-PAST No-NOM famous painter is No-NOM ornament is
'It was a famous painter who painted a landscape, and it is on display.'
*風景画を書いたのが有名な画家であるのが飾ってある。
(Nishigauchi, 2004, 119: (27))

On the other hand, the HERC involving a cleft sentence as in (97) can be acceptable on the basis that an HERC is insensitive to the thetic and categorical distinction.

(97) [Kai-ta no-ga yuumei-na gaka de-aru huukeiga]-ga kazatte aru.
paint-PAST No-NOM famous painter is landscape-NOM ornament is
'A landscape such that it was a famous painter who painted it is on display.'
書いたのが有名な画家である風景画が飾ってある。
(Nishigauchi, 2004, 119: (28))

Nishigauchi assumes that the thetic focus in HIRCs plays an important role in determining the internal head when there is more than one candidate as in (98).

(98) a. [Gakusei-ga syntax-no ronbun-o kai-ta no]-kara sensei-ga
student-NOM syntax-GEN paper-ACC write-PAST No-from professor-NOM
inyoo-shita.
quote-PAST
'A student wrote a syntax paper and the professor quoted from it (=the paper).'
学生がシンタックスの論文を書いたのから先生が引用した。

(Nishigauchi, 2004, 119: (29a))

b?*[Gakusei-ga syntax-no ronbun-o kai-ta no]-kara meeru-o morat-ta.
student-NOM syntax-GEN paper-ACC write-PAST No-from email-ACC got
'A student wrote a syntax paper and I got an email from her / his (=the student).'
?*学生がシンタックスの論文を書いたのからメールをもらった。
(Nishigauchi, 2004, 119:(29b))

Under his analysis, *ronbun (o)* 'paper' of the verb *kak(u)* 'write' within the HIRC in (98a) is a candidate for the thetic focus while the argument 'paper' functions as the argument of the main verb *inyosur(u)* 'quote' in the matrix clause. On the other hand, in (98b), despite of the fact that the internal argument 'paper' of the verb *kak(u)* within the HIRC can be the thetic focus, the internal head which functions as the head in the matrix clause is 'student'. As a result, the acceptability of the HIRC is lower than the (a) sentence.

Following these observations, Nishigauchi assumes that the interpretations of HIRCs in Japanese involve the thetic judgments, where the object position of a verb of creation or the subject position of an unaccusative verb[2] can be the canonical positions for a thetic focus. He further observes that these arguments typically occur in a certain position within a VP, which is the Spec of a VP that occupies an inner layer in VP-shell structures.[3] This position also holds a theme role, and it is typically realized as a direct object of a transitive verb or a subject of an unaccusative verb.

3.4.2 Thetic Judgment and HIRCs

We assume that verbs involved in the thetic judgment usually occur in HIRCs. Those verbs generally take direct objects on the surface. In that respect, some verbs that appear in CRs, such as *tokasu*, 'melt' and *wakasu*, 'boil,' should be related with the construction of HIRCs on the basis that they also take direct objects bearing theme roles. However, as we have reviewed, this is not the case with the verbs like *tokasu* as illustrated in the following example.

(99) CR

Kate-wa [[tennen-no-koori-o tokashi-ta] no]-de koohii-o ire-ta.
Kate-TOP natural-GEN-ice-ACC melt-PAST no-with coffee-ACC make-PAST

'Kate made coffee with the water which was made by melting down natural ice.'
ケイトは天然の氷を溶かしたのでコーヒーを入れた。

[2]The subject position of unaccusative is generally considered to be base-generated in the internal argument position in a VP.

[3]The idea of VP shell is first put forth by Larson (1988)

The direct object of the verb *tokasu* is a theme role; however, the post-relative *no* is interpreted as a pronominal. This *no* seems to refer to a result state or a resultant object of the direct object of the verb, which is not explicitly represented on the surface. The sentence is treated as a CR. Then, if we modify the sentence in the example above to be an HIRC as in (100), is it possible to be treated as such? The direct object of the verb *tokasu*, 'natural ice' cannot be equated with the post-relative *no*. When the *no* is interpreted as a pronominal, it will refer to some result state of the direct object. This is not the case with (100). The sentence of (100) is not entirely regarded as an HIRC either regardless of the noun phrase, *-no-sanchi*, 'the place of production' in the matrix clause, which apparently goes well with the noun phrase 'natural ice' in the relative clause. One of the possible reasons why the sentence is not fully acceptable as an HIRC is that the noun phrase 'natural ice' cannot go in the foregrounded as a thetic focus. In other words, the entity of natural ice might be presupposed due to the semantic nature of the verb *tokasu*. This verb seems to presuppose something that is not melted yet accompanying the process of the change of state. In that respect, the *tokasu*-type of change of state verb is not likely to occur in an HIRC.

(100) HIRC

??Kate-wa [[kakigoori-ya-de kat-ta tennen-no-koori-o tokashi-ta
Kate-TOP ice.shaved-parlor-LOC buy-PAST natural-GEN-ice-ACC melt-PAST
{no / *mono}]-no sanchi-o shittei-ta.
{No / thing}-GEN production.place-ACC know-PAST

'Kate melted natural ice which she bought at the ice shaved parlor, of which she knew a place of production.'

??ケイトはかき氷屋で買った天然の氷を溶かした { の / *もの } の産地を知っていた。

As another type of change of state verb, which behaves slightly differently from *tokasu*, the verb *wakasu*, 'boil' can occur in a CR as in the (a) sentence in (101). Again, the HIRC which is exemplified as in the (b) sentence of (101) is not totally accepted. In fact, the (b) sentence may be slightly better than (100). The noun phrase 'mineral water' in the (b) sentence of (101) will probably go in the foreground, and the verbal phrase *wakashi-ta*, 'boiled' may go in the background. In that case, the sentence is regarded as an HIRC since the direct object 'mineral water' can be regarded as a thetic focus of the verb *kat-ta*, 'bought' in another embedded relative clause. If not, the post-relative *no* will refer to the result state by the action denoted by the verb *wakasu*. If this is the case, the sentence should be regarded as a CR. However, the acceptability of the sentence as intended is relatively low.

(101) a. CR

Kate-wa [[seijooishii-de kat-ta mineraru-wootaa-o wakashi-ta] no]-de
Kate-TOP seijooishi-LOC buy-PAST mineral.water-ACC boil-PAST no-with
koocha-o ire-ta.
tea-ACC make-PAST

'Kate made tea with the mineral water that had been boiled, which she bought at Seijoishii.'

ケイトは成城石井で買ったミネラルウオーターを沸かしたので紅茶をいれた。

b. HIRC

?Kate-wa [seijooishii-de kat-ta mineraru-wootaa-o wakashi-ta no]-no
Kate-TOP seijooishii-LOC buy-PAST mineral.water-ACC boil-PAST No-GEN
sanchi-o shittei-ta.
production.place-ACC know-PAST

'Kate knew the production place of mineral water that she bought at Seijoishii, which had been boiled.'

?ケイトは成城石井で買ったミネラルウオーターを沸かしたのの産地を知っていた。

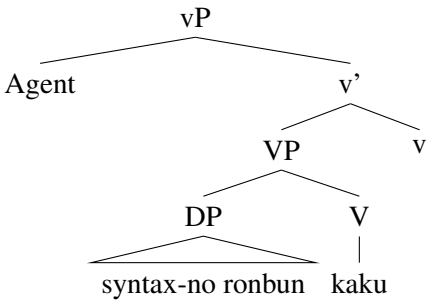
From these observations, change of state verbs don't usually occur in HIRC environments. If there occurs some element like the verb *kau*, 'buy,' such an element will induce the syntactic contribution to the interpretation of a relative clause as an HIRC. It means that the change of state verb *wakasu* does not contribute to the interpretation of the relative clause. In the case of the (b) sentence of (101), the direct object of the verb *wakasu* in the relative clause may be selected as a thetic focus along with the verb *kau* in another relative clause in the HIRC. If a change of state verb in the relative clause is prioritized, such a relative clause is likely to be treated as a CR. In short, the post-relative *no* of a CR refers to a sense of the result state. Change of state verbs encode senses of result state lexically.

There are some other verbs which do not construct HIRC sentences as in (102). The verb *kaku*, 'write' is a transitive verb and its direct object is 'a (syntax) paper,' which satisfy the condition of being a theme role and a direct object of the verb. As a creation verb, the verb *kaku* presents the existence of the paper that Taro wrote. On the other hand, *yomu*, 'read' cannot construct an HIRC even though the verb take a direct object of a theme argument. The sentence is hardly regarded as a CR either. The verb *yomu* does not involve any obvious result state although it denotes a completeness of the action of reading as Rappaport Hovav and Levin (2010) claim for its English counterpart, *read*.

(102) [Taroo-ga syntax-no ronbun-o {kai-ta / ?*yon-da} no]-kara sensei-ga
Taroo-NOM syntax-GEN paper-ACC write-PAST / read-PAST No-from professor-NOM
kopii-o tot-ta.
copy-ACC take-PAST
'Taro wrote / ?*read a syntax paper and the professor made a xerox out of it (= the paper).'
太郎がシンタックスの論文を{ 書いた / ?*読んだ } のから先生がコピーを取った。
(Nishigauchi, 2004, 121: (34))

Nishigauchi claims the difference between the two types of verbs like *kaku* and *yomu* may reside in the positional difference as Basilico (1998) claims in his research on diathesis alternations. Basilico argues that the argument alternations is related with positional differences based on the meanings of verbs, applying the idea of the two modes of judgments.[4] Basilico and Nishigauchi consider the direct object of a transitive verb, which is related with a thetic focus, is placed in a Spec of the lower VP of the VP shells, which is illustrated in (103).

(103)



In sum, an HIRC requires a verb to allow a thetic judgment. In other words, the direct object position of a transitive verb is the canonical position for the thetic focus, which bears a theme role. The theme object can be the candidate for the internal head of an HIRC and is likely to be shared with the matrix clause. Under an HIRC environment, the syntactic structure may contribute to the interpretation of the relative clause. On the other hand, a CR requires a verb that contains a sense of resultant object or result state in its meaning, i.e., kinds of change of state verbs. Under a CR environment, the semantic structure may involve in the interpretation of the relative clause.

3.5 Problems and Objectives

Following the previous studies on HIRCs, the interpretation of an HIRC involves the existential implication, which is related with the thetic predication form. Under such a predication form, it is assumed that an entity or event that a direct object of a verb denotes comes into being. The direct object is generally a theme argument which positions in the Spec of inner VP of VP shells. In short, the syntactic structure will play an important role in an HIRC.

[4] See Basilico (1998) for details of the approaches to a wider range of alternations

On the other hand, a CR behaves differently from HIRCs as we have reviewed up to this point. The most significant difference is the status of the post-relative *no*. The *no* in a CR is considered to be a pronominal wheres the *no* in an HIRC to be a complementizer. At the same time, the direct object of a verb in the relative clause seems to acquire a new sense of meaning by the action denoted by the verb. Meanings of the verbs may be involved in a CR.

In other words, there are two distinctive factors between a CR and an HIRC constructions. One of the factors is the category of the post-relative *no*. The other is the relation of an object noun phrase within the relative clause with the referent which the relative clause and the *no* denote. These points are summarized in (104).

(104) a. The post-relative *no* can be pronominal when the object noun phrase within the relative clause gets a new sense of meaning with some kind of factors.

b. The post-relative *no* can be a complementizer when the object noun phrase within the relative clause hold the same meaning as that of the relative clause with the *no*.

The interrelation between the relative clause and the post-relative *no* of both CR and HIRC seems to involve a certain type of verb and its internal argument. Those data from the previous studies we have seen up to this point indicate the following points.

(105) a. A type of verb which usually occurs in a CR is the change of state verb.

b. A type of verb which often occurs in an HIRC is a verb that has a theme argument as a direct object, which allows a thetic focus (Nishigauchi, 2004).

It is largely assumed that change of state verbs take direct objects that bear theme roles. A type of the verb which takes a theme argument occurred in an HIRC can be a kind of change of state verb such as the verb *kaku*. Some change of state verbs may appear in both CR and HIRC environments. We look into the semantic nature of these verbs and give them formal representations by applying the theoretical devices based on some lexical theories. Then, we show that the change of state verbs have the semantic predicate of BECOME. We attempt to present that only in the CR, the predicate BECOME will play a key role in allowing a sense of change or transformation of an entity that a direct object denotes meanwhile syntactic contribution will be a key element in an HIRC.

Chapter 4 Semantic Nature of Change of State Verbs

4.1 Introduction

In this chapter, we examine a set of verbs that bring changes to properties of entities that their internal arguments denote. We especially focus on those verbs that denote some kind of change of state, which are usually called as the change of state (COS) verbs. We believe this type of verb often appears in the relative clauses that are discussed in this dissertation: an HIRC and a CR. It is essential that we look into the nature of COS verbs for discussing these two relative clauses.

First, We introduce the well-known phenomena of so-called "Argument Alternations" since COS verbs have often been studied along with this linguistic phenomena. The verbs usually participate in some argument alternations. Then, we quickly make a review of some of the approaches to those alternations. After that, we discuss Japanese COS verbs with the help of some of the previous approaches for representing lexical meanings of the verbs.

4.2 Argument Alternations and Change of State Verbs

4.2.1 Change of State Verbs

Many research on the argument alternations have been conducted because such phenomena present many intriguing questions about the syntactic realization of arguments of verbs. Many theories of grammar largely assume that verbs of semantically coherent class are regarded to have similar pattern of argument realization. Among such verbs, COS verbs have been paid close attention to for these past years. However, we assume that it is difficult to clarify the classification of COS verbs. We use the term COS verbs in a more broader sense and have categorized roughly into four types as shown in (106) for discussion purpose. Some of the COS verbs like *carve*-type verbs have both a sense of manner and a notion of result state. Other types of verbs such as verbs of change of possession or verbs of manner that are mentioned in this chapter are indicated in (107) and (108) as well. We refer the reader to the analyses on these verbs in Levin (1993), Levin and Rappaport Hovav (2005), Rappaport Hovav and Levin (2002, 2010) for any further details on the brief classification list.

(106) COS verbs:

a. *build*/*break*-type
tateru, kowasu, kaku, etc.

build, break, write, etc.

b. *cool*-type
samasu, kawakasu, koorasu, etc.
cool, dry, freeze, etc.

c. *cooking*-type
niru, yaku, itameru, etc.
simmer, bake, fry, etc.

d. *carve*-type
horu, amu, wakasu, etc.
carve, knit, boil, etc.

(107) Verbs of Change of Possession

a. *give*-type
ataeru, uru, etc.
give, sell, etc.

(108) Manner verbs

a. spray/load-type
nuru, tsumu, etc.
paint, load, etc.

b. *hit*-type
tataku, naderu, etc.
hit, stroke, etc.

Most of the COS verbs are assumed to involve in the causative alternation. They do not usually participate in the object argument alternations. However, some of them such as cooking verbs as well as the *carve*-type verbs can participate in the object argument alternations like a material and product alternation. A number of approaches have been suggested from both syntactic and semantic points of view. As Pinker (1989) explains, the verbs that participate in the alternations are assumed to be closely tied with their own lexical meanings. We mainly focus on the semantic-based approaches in the following sections.

4.2.2 Argument Alternations

Some of the verbs involved in two of the most well-known alternations are illustrated in (109) and (110), which are the give type of verb and the spray/load type of verb, respectively. These types of verbs participate in the dative and locative alternations. It is considered that one of each pair of

the alternations has a different direct object position from the other although each verb has the same basic meaning or root.

(109) The dative alternation

a. Terry gave the newspaper to Kim.

b. Terry gave Kim the newspaper.

(Levin & Rappaport Hovav, 2005, 186: (1))

(110) The locative alternation

a. Devon smeared butter on the toast.

b. Devon smeared the toast with butter.

(Levin & Rappaport Hovav, 2005, 186: (2))

In (109), the direct object *the newspaper* in the (a) sentence is a theme and it c-commands a recipient of the prepositional *to*-phrase whereas in the (b) sentence the recipient *Kim* c-commands the theme *the newspaper*. It may seem one of the two variants is derived from the other. Larson (1988) attempts to account for this idea from syntactic point of view and suggests the idea of "VP-shell" with the empty projection of the verb head. Japanese counterpart of this type of verb like *ageru* is also considered to be closely tied with the structural hierarchy (Sadakane & Koizumi, 1995; Miyagawa, 1997; Koizumi, 2009; Kudo, 2015).

In the locative alternation of (110), the locative argument expressed in a preposition as *on the toast* in the (a) sentence does not have to be fully covered with the butter while, in the (b), the argument *toast* has to be completely covered with butter when it is expressed as a direct object. The characteristic of this meaning difference is known as "holistic/partitive" effect. Japanse also has a similar type of verb as the one in (110). The verb *nuru*, 'paint' can participate in the locative alternation as shown in (111). The direct object *kabe*, 'wall' in the (b) sentence of (111) needs to be covered fully with a green paint whereas the locative argument *kabe-ni*, 'on the wall' does not. In short, the direct object is understood as a totally affected argument.

(111) a. Ken-ga midori-iro-no-penki-o kabe-ni nut-ta.
Ken-NOM green-color-GEN-paint-ACC wall-DAT paint-PAST
'Ken put a green paint on the wall. '
ケンが緑色のペンキを壁に塗った。

b. Ken-ga kabe-o midori-iro-no-penki-de nut-ta.
Ken-NOM wall-ACC green-color-GEN-paint-with paint-PAST
'Ken painted the wall with a green paint.'
ケンが壁を緑色のペンキで塗った。

There are other type of alternations such as the conative alternation as in (112) and (113). The verbs that participate in this alternation are manner verbs such as *hit* or verbs of cutting such as *cut, slash* or *chop*. As Pinker (1989) and Levin (1993) observe, the use of the verb in the (b) sentences indicates that the subject is trying to affect the oblique object without specifying whether or not the action is succeeding.

(112) a. Paula hit the door.

b. Paula hit at the door.

(Levin, 1993, 41: (84))

(113) a. Margaret cut the bread.

b. Margaret cut at the bread.

(Levin, 1993, 41: (87))

Finally, another well-known alternation is the causative alternation as in (114). In the (a) sentence, the theme is a direct object whereas a subject in the (b) sentence. It is largely assumed that the direct object of this type of verb cannot be omitted. COS verbs often involve in this type of alternation. The same observation can be made for the Japanese counterparts, which we discuss in a later section. This type of verb encodes the coming about of some particular result state as Rappaport Hovav and Levin (2010) regard it as a result verb. In other words, the direct object (or the subject) of a COS verb is affected.

(114) The causative alternation

a. The clumsy waiter broke a whole tray of glasses.

b. A whole tray of glasses broke.

(Levin & Rappaport Hovav, 2005, 187: (8))

Based on these observations, some alternations like the locative and conative alternations involve the meaning differences between the two variants. This semantic characteristics leads to a certain notion. Sometimes the semantic notion of "affectedness" is regarded as a key factor for the alternations like the locative alternation. An object in a locative alternation is considered to be affected by the action denoted by a verb. In a sense, the direct object of a COS verb, *break* is also considered to be affected. However, the notion of affectedness is different among the verbs that participate in locative alternations and the COS verbs. It is rather vague (Kageyama, 1996) and difficult to clarify (Levin & Rappaport Hovav, 2005). Kageyama (1996) even suggests that the semantic predicate ACT-ON should be used to represent those verbs like *hit* so that some notion of affectedness without a sense of change of state can be captured. The element of the semantic predicate BE should be defined as a theme which represents the change of state. His idea of subsuming

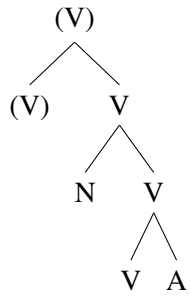
the notion of affectedness into semantic predicates is what Levin and Rappaport Hovav (2005, 210) describe as a recent attempt of subsuming the same notion into the aspectual notions of telicity and incremental theme, which are usually tied with direct objects of verbs.

In summary, verbs involved in the dative alternation usually denote change of possession. The dative alternation shifts its structure between the prepositional construction and the double object construction. The prepositional object in the former construction turns up as the direct (first) object in the double object construction. On the other hand, verbs involved in the locative alternation usually denote a type of motion and an end state. The other verbs involved in the conative alternation usually denote notions of contact and motion. Those verbs that denote a sense of motion as well as a notion of contact are usually regarded as manner verbs. The COS verbs involved in the causative alternation behave differently from the verbs that participate in the dative alternation or the locative alterantion as well as the conative alternation.

4.2.3 Structural Approach and Semantic Roots

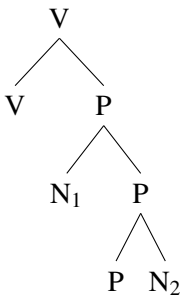
As one of the approaches of mapping semantic roles to its equivalent syntactic arguments, Hale and Keyser (1993) propose the following structures in (115) and (116). They investigate on deadjectival verbs like *clear*, which is a type of COS verb and denominal verbs like *saddle* to explain that some verbs are lexically related with a particular syntactic structure. Their proposed structures are based on the idea of VP-shell introduced by Larson (1988).

(115) Deajectival verb



(Hale & Keyser, 1997, 211: (15))

(116) Denominal verb



(Hale & Keyser, 1997, 213: (21))

Both structures in (115) and (116) have an empty verbal head. The each empty head has a certain type of lexical component as a complement, which is now considered to be a verb "root." In (115), the *A* position is regarded as an adjectival root, while in (116), the N_2 position is regarded as a nominal root. Each type of the verbs is derived by "successive incorporation into immediately governing heads" (Hale & Keyser, 1997, 205). Their idea of using a lexical component as a complement such as *A* for an adjective head in the diagram above, is equivalent to what Levin and Rappaport Hovav (1995) calls it "constant (= root)" in their semantic representation. Nowadays, the term, a (verb) root is widely accepted (Levin & Rappaport Hovav, 2005, 71) so that we use this term in the remainder of the chapters.

4.2.4 Aspectual Approach and Semantic Roots

Levin and Rappaport Hovav (2005, 232) argue that a verb must have a root that is basically associated with a simple event structure. Properties of roots of verbs can be a determinant of argument alternations so that the verb with the similar roots show the similar alternations. According to Levin and Rappaport Hovav, verbs denoting manner, which is a synonym with activity in their sense, such as *sweep* or *sew* essentially associate with simple event structure. Such verbs will allow object alternations. On the other hands, COS verbs are usually assumed to lack object alternations. These verbs are regarded as being associated with a complex event structure, which prevents them from participating in the object argument alternations (Levin & Rappaport Hovav, 2005, 232).

Verbs that are lexically represented by a simple event structure can participate in both object alternation and event composition, meanwhile the verbs associated with a complex event structure cannot. According to Levin and Rappaport Hovav (2005), a complex event structure consists of two parts, a causing subevent and a result subevent: the former can be represented with the predicate ACT whereas the latter with the predicate BECOME. They argue that the type of result subevent can be obtained from the type of manner when a verb with a manner root is found in a complex event structure by composition. As shown in (117) and (118), these examples show that a manner verb can have more than one result type of subevent since it has a simple basic event structure of ACT. Consequently, this type of verb can be found in multiple argument alternations.

(117) The locative alternation

a. Kelly sewed bows on the costume.

b. Kelly sewed the costume with bows.

(Levin & Rappaport Hovav, 2005, 233: (79))

(118) The material-product alternation

a. Kelly sewed the piece of silk into a ball gown.

b. Kelly sewed a ball gown out of the piece of silk.

(Levin & Rappaport Hovav, 2005, 233: (80))

Rappaport Hovav and Levin (1998, 2010) postulate that verb meanings can be decomposed into a *template*, which is a semantic or eventive predicate like CAUSE, ACT or BECOME, and a *root*. The former is assumed to define the temporal and causal structure of the event whereas the latter determines the meaning of a verb. According to Rappaport Hovav and Levin (1998), most roots have a single ontological type, which is drawn from a fixed set of types such as state, thing, place, manner, etc. Such an ontological type mainly determines a root's basic association with an event structure type (Levin & Rappaport Hovav, 2005).

For example, COS verbs like *break* and manner verbs like *sweep* are illustrated in (119). The lexical root of the COS verb *break* can name a result state, which is *broken*, as in (119a), but it cannot modify the predicate ACT at the same time. The root of the manner verb *sweep* can modify the predicate ACT as in (119b).

(119) a. Kim broke the dishes.
[x ACT-ON y] CAUSE [BECOME [y < *BROKEN* >]

b. Kim swept the floor.
[x $\text{ACT}_{\langle \text{SWEEP} \rangle}$-ON y]

Rappaport Hovav and Levin (1998, 2010) regard a root of a verb contains only a single fixed type and it can be only associated with one semantic predicate to denote an event, either as an argument of BECOME denoting a result or a modifier of ACT denoting a manner. In contrast, Beavers and Koontz-Garboden (2012) consider that a root can contain more than one fixed type and that such a verb with two fixed types can function as either type of the two.

Beavers and Koontz-Garboden (2012) and Koontz-Garboden and Beavers (2017) argue that the some manner of cooking verbs such as *barbecue, blanch, broil*, etc. are considered to encode result states to some degree even though they denote a specific manner. These verbs behave like the verbs containing caused-result roots such as *thaw, melt* in (120). They assume that both verbs entail the event of change by the action that the verbs denote. For example, in the (a) sentence of (120), the meat became soft by thawing.

(120) a. John thawed the meat again.

b. John melted the soup again.

(Beavers & Koontz-Garboden, 2012, 361: (74))

Following Beavers and Koontz-Garboden, we assume that some manner verbs encode result states. We further argue that some COS verbs behave like manner verbs, assuming that the basic event structure of a verb is not determined by its root, but its truth conditional level in the lexicon.

4.3 Semantic Approach to Japanese Change of State Verbs

With this much in mind, we now examine Japanese COS verbs. As we have examined on some previous studies on argument alternations, it is largely assumed that certain patterns of argument realizations are related to semantically same classes of verbs.

Rappaport Hovav and Levin (1998) explain that the lexical semantic representation takes the predicate decomposition form which is made up of two major types of components; primitive predicates and roots. The primitive predicates represent the structural aspect of verb meaning while the roots represent the idiosyncratic meaning of verb meaning. They refer to the lexical semantic representation consisting of primitive predicates and a verb root as a "event structure template." As Hidaka (2011) points out that the lexical semantic representation or LCS represents an event structure, we will use the term 'LCS' or a 'lexical semantic representation' in the dissertation instead of "event structure template" proposed by Rappaport Hovav and Levin.

Along with LCS, we apply the following semantic representation to notate lexical meanings of COS verbs. This notation is based on the theory of Generative Lexicon (Pustejovsky, 1995) and is modified by Kageyama (2005) and further by Hidaka (2011). The notation can indicate the truth-conditional section (TS) and non-truth-conditional section (NTS). See Chapter 2 for further details about the theoretical device.

(121)
$$\begin{bmatrix} \text{ARG} = \left[\text{Argument structure}\right] \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{FORMAL: the eventuality of a verb} \\ \text{CONST: LCS of a verb} \end{bmatrix} \\ \text{NTS} = \begin{bmatrix} \text{TELIC: the resultative state which a verb entails} \\ \text{AGENT: the external factors which a verb brings in} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Applying this lexical semantic representation, we can capture the compositionality of some COS verbs that participate in the argument alternation more clearly than Levin and Rappaport Hovav suggest. Our representation system can show even some manner verb like *sew*, which Levin and Rappaport Hovav regard as a verb of a simple event structure, encode a result state in its lexical meaning.

4.3.1 Verbs of Transformation

Like English COS verbs, Japanese also has verbs that participate in the causative alternation. Among such verbs, we have *samasu*, 'cool,' *koorasu*, 'freeze,' or *kawakasu*, 'dry,' etc., which usually denote change of state or some sense of transformation. This type of verb usually has a transitive causative verb form or an intransitive inchoative form as in (122) and (123). In both cases, the (a) sentences use a transitive form and the (b) sentences use an intransitive form[1].

(122) a. Oyu-o samashi-te gyokuro-o ire-ta.
hot.water-ACC cool.past-COP green.tea-ACC pour-past.
'I cooled the hot water and made a green tea with it.'
お湯を冷まして玉露を入れた。

b. Oyu-ga same-ta.
hot.water-NOM cool-PAST
'The hot water cooled.'
お湯が冷めた。

(123) a. Sentaku-mono-o kawakashi-te ki-ta.
laundry-stuff-ACC dry-COP put.on-PAST
'I dried the laundry and put it on.'
洗濯物を乾かして着た。

b. Sentaku-mono-ga kawai-ta.
laundry-stuff-NOM dry-PAST
'The laundry dried.'
洗濯物が乾いた。

This type of verb cannot participate in an object argument alternation as shown in (124). Unlike the manner or activity verbs such as *tataku*, 'hit' or *haku*, 'sweep,' COS verbs like *samasu* and *koorasu* have more severely restricted choice of objects. Those objects in (124) cannot be theme of the verbs. A *samasu* type of COS verb has to express the theme of change of state. Such a theme argument needs to be realized as a direct objects as Levin and Rappaport Hovav (1999, 2005) claim about the same type of English verb.

(124) a. *Mizu-o samashi-ta.
water-ACC cool-PAST

[1] Japanese verbs make a shift in forms of a transitive and an intransitive by adding affixes such as *sa*-**ma**-*su* vs. *sa*-**me**-*ru*. Many researchers have focused on the affixation and its morphological nature.

'I cooled the water.'
*水を冷ました。

b. *Koori-o koorashi-ta.
ice-ACC froze-PAST
'I froze the water.'
*氷を凍らした。

Following Levin and Rappaport Hovav (1999, 2005), COS verbs like *samasu* or *koorasu* have a complex event structure with two subevents, which is similar to the English counterparts such as *cool*. The *cool*-type verbs have complex event structures compared to the manner verbs like *hit* or *sweep* that have a simple event structure. In short, the COS verbs like *cool, break* encode the result states lexically whereas the manner verbs like *hit, sweep* do not. Levin and Rappaport Hovav schematize them as in (125).

(125) a. [x ACT$_{<\text{MANNER}>}$]
b. [[x ACT] CAUSE [BECOME [y < STATE >]
(Levin & Rappaport Hovav, 2005, 115: (45))

Rappaport Hovav and Levin (1998, 2010) assume that the ontological category of the root determines an event schema that is integrated into. Roots in (125) are arguments of each event schema, which are represented in angle brackets. In the case of the manner verbs like *hit* or *sweep* schematized in (125a), a manner root modifies the predicate ACT. The roots of COS verbs like *cool* or *break* schematized in (125b) are arguments of the predicate BECOME.

Rappaport Hovav and Levin (2010) assume that a telicity and a result state are not equated even though telicity is said to involve a result state. They argue that many COS verbs are not lexically telic by showing the following examples of (126). The verb *cool* shows both telic and atelic uses although it is regarded as a COS verb. As shown in (126), the telicity is assumed to be determined compositionally.

(126) a. The chemist cooled the solution for three minutes. (atelic use)
b. The chemist cooled the solution in three minutes; it was now at the desired temperature. (telic use)
(Rappaport Hovav & Levin, 2010, 27: (14))

What Rappaport Hovav and Levin claim is parallel to the Japanese counterparts of *cool*-type verbs. The Japanese verb *samasu* is also compatible with the durative *for*-phrase as well as the

nondurative *in*-phrase as in (127). It seems that the telicity is identified by way of a composition with a temporal adverbial expression. Both cases do not involve an obvious result state even if the verb has a sense of result state.

(127) a. Yaketa-kinzoku-o 10-pun-kan hodo samasu.
burned-metal-ACC 10-minutes-for about cool
'I cooled the burned metal for about 10 minutes.'
焼けた金属を 10 分間ほど冷ます。
(Kageyama, 1996, 62: (35b))

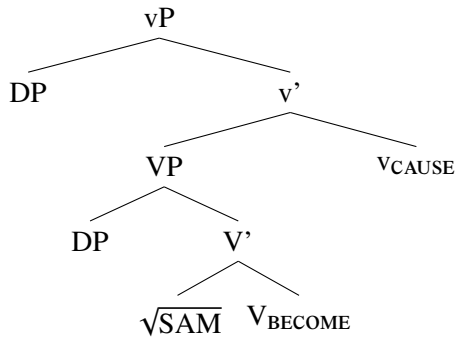
b. Yaketa-kinzoku-o 10-pun-de samasu.
burned-metal-ACC 10-minutes-in cool
'I cooled the burned metal in 10 minutes.'
焼けた金属を 10 分で冷ます。

Considering the idea of the event schemata and the observation made in the above, the *samasu*-type verbs consist of two subevents of the manner (activity) with ACT-ON and the achievement state with BECOME predicate at TS as in (128). Like the English verb *cool*, *samasu* contains a constant value of *STATE* through an idiosyncratic meaning of the verb, i.e. "root." The predicate BECOME with the help of a verb root presents an inchoative state. This type of verb does not contain a resulting object in the truth-conditional part, but it is contained in a non-truth-conditional level. The resulting object is obtained through the root of verb, *SAM (STATE)*, which varies in accordance with the meaning of a verb. As for representing inchoative state, we adopt more predicate logic like [BECOME (BE-AT)] instead of Kageyama (1996)'s idea.

(128)
$$\begin{bmatrix} \textit{samasu}\ (\text{cool}) \\ \text{ARG} = \begin{bmatrix} \text{ARG 1: } x \\ \text{ARG 2: } y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \left[\text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, \sqrt{SAM}))\right] \\ \text{NTS} = \begin{bmatrix} \text{TELIC: } \textit{SAM}\ (y) \\ \text{AGENT: } \neg \textit{SAM}\ (y) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Applying the ideas on the structural approaches by Hale and Keyser (1993), the structure of (128) can be depicted as in (129). The lower VP can be a structure of the intransitive of *samasu* because this type of verb can have both intransitive and transitive forms. *Samasu*-type verbs do not involve obvious result states since they show both telic and atelic uses as in (127).

(129) The structure of *samasu*



The other *samasu*-type verbs such as *kawakasu* and *koorasu* can have similar semantic representations and structures as the verb *samasu*. These verbs also encode a result state obtained through a root of the verbs in their lexicon.

4.3.2 Verbs of Creation and Consumption

Levin and Rappaport Hovav (2005, 116-117) argue that some other verbs like *build* or *write*, which are often considered to be accomplishments, can also be expressed as a single event even though these verbs contain a complex event structure consisting of two subevents, a causing event and an accomplished state of event. They claim that the subevents of the creation verbs like *build, write*, the consumption verbs like *eat*, and other so-called incremental theme verbs like *translate, study* are temporally dependent although the verbs involve an event with a duration and an endpoint. The direct objects of these verbs, which usually have a thematic role unlike *cool*-type verbs, are not necessarily expressed as in the (a) sentences in (130) and (131). The same observation can be applied to the Japanese counterparts as in the (b) sentences in (130) and (131).

(130) a. Dana ate. (Levin & Rappaport Hovav, 2005, 117: (47a))

b. Kinoo-wa tabe-ta.
yesterday-TOP eat-PAST
'Yesterday, I drank.'

(131) a. Kelly studied. (Levin & Rappaport Hovav, 2005, 117: (47c))

b. Kinoo-wa benkyoshi-ta.
yesterday-TOP study-PAST
'Yesterday, I studied.'

Without a theme argument, both *nomu*, 'drink' and *benkyosuru*, 'study' can have an atelic reading. Unlike the verb *samasu*, these two verbs have a difference in the acceptability when they combine with durative and non-durative temporal expressions.

(132) a. Kinoo-wa 1-jikan(-no-aida) non-da.
yesterday-TOP 1-hour-for drink-PAST
'Yesterday, I drank for an hour.'
昨日は 1 時間（の間）飲んだ。

b. ?Kinoo-wa 1-jikan-de non-da.
yesterday-TOP 1-hour-in drink-PAST
'Yesterday, I drank in an hour.
?昨日は 1 時間で飲んだ。

The difference in the acceptability of two readings hold the same even when a direct object is realized as in the (a) sentence of (133). When the object is expressed with a numeral quantifier as in the (b) sentence, it has a telic reading.

(133) a. Kino-wa sake-o {1-jikan(-no-aida) / ?1-jikan-de} non-da.
yesterday-TOP sake-ACC {1-hour-for / 1-hour-in} drink-PAST
'Yesterday, I drank sake {for an hour / in an hour}.'
昨日は酒を {1 時間（の間）/ ?1 時間で } 飲んだ。

b. Kino-wa 20-pai-no-sake-o 1-jikan-de non-da.
yesterday-TOP 20-glass-GEN-sake-ACC 1-hour-in drink-PAST
'Yesterday, I drank 20 glasses of sake in an hour.'
昨日は 20 杯の酒を 1 時間で飲んだ。

The same observation is made about the the English counterpart of the verb *nomu*, which is 'drink.' As Levin and Rappaport Hovav (2005) indicate, *drink* cannot be compatible with a non-durative *in*-phrase without a direct object as in (134). The sentence still has an atelic reading even though the verb combines with an object, in which case is a mass noun, as in the (b) example of (134). However, it can have a telic reading when the verb takes a quantified NP like *three glasses of lemonade*.

(134) a. Morgan drank for five minutes/ *in five minutes.

b. Moran drank lemonade for five minutes/ *in five minutes.

c. Morgan drank three glasses of lemonade in five minutes/ *for five minutes.

(Levin & Rappaport Hovav, 2005, 90: (10))

From these observations, *nomu*-type of consumption verbs do not have a sense of completeness truth-conditionally as in (135) unlike *samasu*-type verbs. The direct object can be omitted as the verb requires a certain type of noun, which carries a meaning of alcohol. The result state is encoded

non-truth conditionally considering the telic reading when the verb combines with a quantified NP. In other words, the verb *nomu* has a simple event structure of ACT-ON truth conditionally. It seems that the verb has a potentiality of composing a complex event structure more flexible than other COS verbs since it has the result state non-truth conditionally in its lexicon.

(135)
$$\begin{bmatrix} \textit{nomu} \text{ (drink)} \\ \text{ARG} = \begin{bmatrix} \text{ARG 1} : x \\ \text{ARG 2: } y \text{ (physical object: liquid)} \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: ACT-ON } (x, y) \end{bmatrix} \\ \text{NTS} = \begin{bmatrix} \text{TELIC: } \neg\exists z \text{BECOME (BE-AT } (y, z)) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

As illustrated in the sentence of (136), the noun phrase *sake-ga* can be interpreted as alcohol when it is explicitly represented or easily be recovered when it is not represented on the surface. This means that the act of consuming alcohol is not completed. In a way, the action that the verb denotes is canceled and the object argument in TS is referred.

(136) sake-o 1-jikan(-no-aida) non-da-kedo mada (sake-ga)
alcohol-ACC 1-hour(-GEN-for) drink-PAST-though yet (alcohol-NOM)
nokot-te-iru.
remain-PAST-COP
'I dank alcohol for an hour, yet there still remained alcohol.'
酒を 1 時間（の間）飲んだけど、まだ (酒が）残っている。

If the verb *nomu* takes a numeral expression as in the (b) sentence of (133), it holds the manner event and the accomplished state in TS. The process of drinking is interpreted as being completed with the disappearance of a drink. We regard this type of the verb *nomu* as $nomu_c$.

(137)
$$\begin{bmatrix} \textit{nomu}_c \text{ (drink)} \\ \text{ARG} = \begin{bmatrix} \text{ARG 1} : x \\ \text{ARG 2: } y \text{ (physical object: liquid)} \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: CAUSE (ACT-ON } (x, y), \neg\exists z \text{BECOME (BE-AT } (y, z))) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The following sentence also supports the validity of the variant $nomu_c$. When *nomu* is used with the nondurative *in*-phrase like *1-jikan-de*, the sentence is not acceptable.

(138) *sake-o 1-jikan-de non-da-kedo mada (sake-ga)
alcohol-ACC 1-hour(-GEN-for) drink-PAST-though yet (alcohol-NOM)
nokot-te-iru.
remain-PAST-COP

'I dank alcohol in an hour, yet there still remained alcohol.'
*酒を 1 時間で飲んだけど、まだ (酒が）残っている。

In contrast to the consumption verb *nomu*, a creation verb, *kaku* presents the existence of an entity that the direct object of the verb denotes. It encodes the resultant object in its lexicon truth conditionally. The following examples in (139) indicate that the expression *ronbun-o kaita* with the durative phrase as well as the nondurative phrase cannot cancel the completion of the action of writing.

(139) a. *Sakuban, 1-jikan-no-aida ronbun-o kai-ta-ga kansei-shi-nakka-ta.
last.night 1-hour-GEN-for paper-ACC write-PAST-but finish-COP-NEG-PAST
'I wrote the paper for an hour last night, but I was not able to finish it.'
*昨晩、1 時間の間論文を書いたが完成しなかった。

b. *Sakuban, 1-jikan-de ronbun-o kai-ta-ga kansei-shi-nakka-ta.
last.night 1-hour-in paper-ACC write-PAST-but finish-COP-NEG-PAST
'I wrote the paper in an hour last night, but I was not able to finish it.'
*昨晩、1 時間で論文を書いたが完成しなかった。

When the verb *kaku* occurs with a direct NP object like *moji*, 'language character' in a sentence like *1jikan-hodo moji-o kaita*, 'I wrote (language) character for about an hour,' the verb may have an atleic reading besides when it is in a progressive form. Otherwise, it predominantly has a telic reading as in (139). It seems that the verb *kaku* can be compatible with the *for*-phrase, however, both sentences generate a contradiction with negation. Considering these observations, we suggest that the following semantic representation for *kaku*. When the proposition of a verb is specified in TS, it cannot cancel the action denoted by the verb.

(140)
$$\begin{bmatrix} \textit{kaku} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } z \\ \text{D-ARG1: } y \end{bmatrix} \\ \text{QUALIA} = \Big[\text{TS} = \Big[\text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME(BE-AT } (y, z)))\Big]\Big] \end{bmatrix}$$

As a similar type of verb, a *tateru ('build')*-type verb also has the sense of creation. It contains the resultant object as well as the telicity truth-conditionally. As shown in the following examples, this type of verb can be compatible with the nondurative *in*-phrase, not with durative *for*-phrase.

(141) a. Ken-ga ie-o 3-kagetsu-de tate-ta.
Ken-NOM house-ACC 3-months-in build-PAST
'Ken built the house in 3-months.'
ケンが家を 3 カ月で建てた。

b. *Ken-ga ie-o 3-kagetsu-no-aida tate-ta.
Ken-NOM house-ACC 3-months-GEN-for build-PAST
'Ken built the house for 3-months.'
*ケンが家を 3 カ月の間建てた。

The semantic representation of the verb *tateru* is illustrated below. The *tateru*-type of verb does not have an atelic reading unless it is in the progressive form. The predicate ACT-ON is focused on along with a logical object in D-ARG. As Pustejovsky (1995, 63-64, 82) postulates, this D-ARG does not have to be realized syntactically.

(142)
$$\begin{bmatrix} \textit{tateru} \text{ (build)} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } z \text{ (physical object)} \\ \text{D-ARG1: } y \text{ (material)} \end{bmatrix} \\ \text{QUALIA} = \Big[\text{TS} = \big[\text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, z))\big]\Big] \end{bmatrix}$$

Both types of verbs, *tateru* and *kaku* have the similar semantic representation as $nomu_c$ in (137). The difference is whether or not the second element of BECOME comes into being. As Pustejovsky (1995, 64) argues, a D-ARG of some creation verbs like *build* and *kaku* is necessary for semantic well-formedness. NTS in our representation system can capture the predicate BECOME which will be encoded at the indirect semantic level in the verbs like *nomu*. Although the *nomu* type of verb is regarded to be a COS verb and it has a telic reading, it still can cancel the act denoted by a verb in contrast to the same class of COS verbs with creation sense such as *kaku* and *tateru*.

Besides those verbs of *samasu, nomu, kaku, tateru*, etc., there are other verbs which behave similarly to both *nomu (drink)*-type verbs and *tateru (build)*-type verbs in Japanese. The verbs on which we focus in the dissertation do not participate in causative alternations, but in object argument alternations, in which the verb shifts its meaning from the sense of transformation to that of creation, or vice versa.

4.3.3 Creation and Transformation Alternations

Some COS verbs in Japanese can have two meanings, both change of state sense and creation sense. As shown in (143), the (a) sentence can mean that Naomi did something to the wood by the action of carving, which leads up to the inference that there would be some kind of wood which was carved. The same observation is possible with the examples of the (a) sentences in both (144) and (145). On the other hand, in the case of the (b) sentence in (143), it means that the statue of Buddha presents its existence by the act of carving. The same thing can be said about the other (b) sentences in both (144) and (145) as well.

In these cases, when a verb has a sense of transformation, it usually combines with a NP which denotes some kind of materials whereas a verb conveys a sense of creation when it combines with a NP which denotes some sort of artifact.

(143) a. Naomi-ga ki-o hot-ta.
Naomi-NOM wood-ACC carve-PAST
'Naomi carved the wood.'
ナオミが 木を 彫った。

b. Naomi-ga butsuzoo-o hot-ta.
Naomi-NOM Buddha.statute-ACC carve-PAST
'Naomi carved a statue of Buddha.'
ナオミが 仏像を 彫った。

(144) a. Mary-ga keito-o an-da.
Mary-NOM wool.yarn-ACC knit-PAST
'Mary knitted with a wool yarn.'
メアリーが 毛糸を 編んだ。

b. Mary-ga seetaa-o an-da.
Mary-NOM sweater-ACC knit-PAST
'Mary knitted a sweater.'
メアリーが セーターを 編んだ。

(145) a. Mary-ga mizu-o wakashi-ta.
Mary-NOM water-ACC boil-PAST
'Mary boiled water.'
メアリーが 水を 沸かした。

b. Mary-ga yu-o wakashi-ta.
Mary-NOM hot.water-ACC boil-PAST
'Mary made hot water.'
メアリーが 湯を 沸かした。

As the sentences show in the above examples, the verbs can have multiple meanings by way of combining with different types of noun phrases. In the case of a *horu*-type verb, such a verb shifts its meanings between a sense of transformation and a creation. This phenomenon, which is often considered to be the material/product alternation (Levin, 1993, 55), can be found in English verbs as in (146), (147), and (148).

(146) a. Mary carved the the wood into a statue.
b. Mary carved the statue.

(147) a. Mary knitted wool into sweater.
b. Mary knitted a sweater.

(148) a. Mary baked one pound of dough into three dozen cookies.
b. Mary baked three dozen cookies from one pound of dough.

All the (b) sentences in these examples of (146), (147), and (148) represent the existence of the entities that direct objects denote while all the (a) sentences represent the entities undergoing some kind of changes described by the verbs. When a verb takes only an object which denotes a material as in (149a), it seems to be slightly worse than the same pattern with a NP that denotes some kind of resultant object like *a statue* as in (146a). However, it can be fine without any object as Levin and Rappaport Hovav (2005, 117) argues that it is a well known fact about verbs of creation and the other verbs of incremental theme.

(149) a. ?Mary carved the wood. (Pustejovsky, 1995, 64: (3d))
b. Mary carved.

In contrast with the English verb *carve*, the Japanese counterpart does not seem to be so awkward. However, it is not plausible to deduct an exact thing resulted from the act of carving as in (150a) even though the sentence implies that some kind of thing can be made out of a piece of wood. It seems to be slightly worse when the verb does not take a direct object and is used out of context.

(150) a. Ken-ga ki-o hot-ta.
Ken-NOM wood-ACC carve-PAST
'Ken carved the wood.'
ケンが木を彫った。

b. #Ken-ga hot-ta.
Ken-NOM carve-PAST
'Ken carved.'
#ケンが彫った。

Like *samasu*-type verbs, *horu*-type verbs can also occur with both durative *-no-aida*, 'for'-phrase and nondurative *-de*, 'in'-phrase as in (151). The acceptability of the sentence with a nondurative phrase is, however, slightly lower than the one with a durative phrase.

(151) a. Ken-ga ki-o 1-jikan(-no-aida) hot-ta.
Ken-NOM wood-ACC 1-hour(-GEN-for) carve-PAST
'Ken carved the wood for an hour.'
ケンが木を 1 時間（の間）彫った。

b. ?Ken-ga ki-o 1-jikan-de hot-ta.
Ken-NOM wood-ACC 1-hour-in carve-PAST
'Ken carved the wood in an hour.'
?ケンが木を 1 時間で彫った。

If a *horu*-type verb is regarded as a simple manner (activity) verb, it should not be accepted with a nondurative phrase at all. A simple manner verb like *naderu*, 'stroke,' cannot be acceptable at all with a nonduravie phrase as in (152).

(152) Ken-ga sono-inu-o {*10-pun-de / 10-pun-kan} nade-ta.
Ken-NOM the-dog-ACC { 10-minutes-in / 10-minutes-for} stroke-PAST
'Ken stroked the dog in 10 minutes.'
ケンがその犬を {*10 分で / 10 分間 } 撫でた。

Levin and Rappaport Hovav (2005) claim that manner verbs like *saw* can have a complex event structure by composing a subevent of result state. They assume that a result state is obtainable by the type of manner that a verb contains. Their assumption can be same as our claim that some manner verbs can have a unspecified result state in their lexicon non-truth conditionally. As illustrated below, the Japanese counterpart of *sew*, which is *nuu*, behaves similar to the verb *horu*.

(153) a. Aiko-ga siruku-no-kiji-o 3-jikan(-no-aida) nut-ta.
Aiko-NOM silk-GEN-fabric-ACC 3-hour(-GEN-for) sew-PAST
'Aiko sewed the silk fabric for three hours.'
愛子がシルクの生地を 3 時間 (の間) 縫った。

b. ?Aiko-ga siruku-no-kiji-o 3-jikan-de nut-ta.
Aiko-NOM silk-GEN-fabric-ACC 3-hour-in sew-PAST
'Aiko sewed the silk fabric in three hours.'
?愛子がシルクの生地を 3 時間で縫った。

Furthermore, *horu*-type verbs show the difference in the acceptability of cooccurring with the two temporal adverbial phrases of the durative and nondurative. In contrast to the verb with a transformation sense in (151), the verb with a creation sense in (154) is totally acceptable with a nondurative phrase. Like a creation verb of *tateru/kaku*-type, a creation sense of *horu*-type has a slightly lower acceptability with a durative phrase.

(154) a. ?Ken-ga 1-jikan(-no-aida) butsuzoo-o hot-ta.
Ken-NOM 1-hour(-GEN-for) Buddha.statue-ACC carve-PAST
'I carved the statue of Buddha for an hour.'
?ケンが 1 時間（の間）仏像を彫った。

b. Ken-ga 1-jikan-de butsuzoo-o hot-ta.
Ken-NOM 1-hour-in Buddha.statue-ACC carve-PAST
'I carved the statue of Buddha in an hour.'
ケンが 1 時間で仏像を彫った。

The verb *nuu* also has a sense of creation when it combines with a NP which denotes some product. The creation sense of the verb *nuu* is compatible with the nondurative *in*-phrase as the verb *horu* with a creation sense.

(155) a. ?Aiko-ga kakuteru-doresu-o 3-jikan(-no-aida) nut-ta.
Aiko-NOM cocktail.gown-fabric-ACC 3-hour(-GEN-for) sew-PAST
'Aiko sewed the cocktail gown for three hours.'
?愛子がカクテルドレスを 3 時間 (の間) 縫った。

b. Aiko-ga kakuteru-doresu-o 8-jikan-de nut-ta.
Aiko-NOM cocktail.gown-ACC 8-hour-in sew-PAST
'Aiko sewed the cocktail dress in eight hours.'
愛子がカクテルドレスを 8 時間で縫った。

In the next section, we will present semantic representations of some of those verbs like *horu* and attempt to indicate that the verbs that participate in object argument alternations may contain a variable of a result state or a resultant object non-truth conditionally. In this way, a manner kind of

verb like *nuu*, 'sew,' can also represent a result state or a resultant object by the action that a verb denotes in a sense of Levin and Rappaport Hovav (2005).

4.3.4 Semantic Representation of the Verbs of Creation and Transformation

As a *horu*-type verb is a two-place predicate with a sense of transformation, the semantic structure of *horu* contains the predicate ACT-ON. The semantic structure can be represented as [ACT-ON (x, y)]. Considering the observation made in the previous section, the verb *horu* can contain telic information in non-truth conditional level[2]. The value of this information is unspecified. This type of verb like *horu* is considered to be a transformation or a change of state sense verb. We call it $horu_t$ and its semantic representation is depicted as in (156). In NTS, the result state or resultant object, which is a variable (z) in BECOME, cannot be specified in any way, but the variable (z) needs to be bind by the existential quantifier for denoting its proposition. We also regard a result state or a resultant object, which is the variable of BECOME, hereinafter as a "*resultant*" for simplification.

(156)
$$\begin{bmatrix} horu_t \text{ (carve) 彫る} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: ACT-ON } (x, y) \end{bmatrix} \\ \text{NTS} = \begin{bmatrix} \text{TELIC: } \exists z \text{BECOME (BE-AT } (y, z)) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

On the other hand, when the verb *horu* takes a NP such as *butsuzoo*, 'a statue of Buddha' as its direct object in the sentence like *Ken-ga butsuzoo-o hot-ta*, 'Ken carved the statue of Buddha,' the semantic representation of the verb is not the same as $horu_t$. As you can see from the following sentence called right-node raising in (157), the meaning of *horu* with its argument *butsuzoo* is different from that of $horu_t$ with its argument *ki* (wood). We call the former type of the verb as $horu_c$. In this case, the verb $horu_c$ has a sense of creation due to its internal argument *butsuzoo*.

(157) ??Ken-wa ki-o[ ], Takeshi-wa butsuzoo-o hot-ta.
Ken-TOP wood-ACC Takeshi-TOP Buddha.statue-ACC carve-PAST
'Ken carved the wood, and Takeshi did the statue of Buddha.'
??ケンは木を [ ]，タケシは仏像を彫った。

Based on the observation above, the semantic representation of $horu_c$ is regarded as the one in (158). The most distinctive characteristic is that $horu_c$ contains telic information, which includes

[2]Hidaka (2011) assumes that the compatibility with the durative and nondurative phrases or the acceptability with the resultative phrase such as *-tearu* can distinguish a certain type of verb such as *niru*, 'simmer,' *yaku*, 'bake,' or*musu*, 'steam,' from the two other classes of verbs: Causative verbs and ACT-ON Verbs. He classifies the verbs such as *niru* based on their aspectual behavior. He calls these verbs 'Semicausative verbs.'

the resultant of being carved, in TS. The variable (z) of resultant places in the direct object position, which is ARG2 while the variable (y) of an object denoting some material degenerates its position, which goes into a D-ARG. The existential quantifier ($\exists$) which binds the variable (z) is integrated into ARG2 when the variable (z) is positioned in that place. The verb $horu_c$ contains the meaning of activity as a causing event, which is the basic meaning of $horu_t$. CAUSE function connects the causing event in TS and the result event in NTS to specify the sense of creation in TS.

(158)
$$\begin{bmatrix} horu_c \text{ (carve) 彫る} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } z \text{ (physical object)} \\ \text{D-ARG1: } y \end{bmatrix} \\ \text{QUALIA} = \Big[\text{TS} = \Big[\text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, z)))\Big]\Big] \end{bmatrix}$$

With this much background, we now consider the verb phrases such as *ki-o horu*, '(to) carve the wood' and *butsuzoo-o horu*, '(to) carve the statue of Buddha.'

First, we present the semantic representation of the phrase *ki-o hotta* in the sentence like *Ken carved the wood* as in (159), applying the qualia structure of $horu_t$ in (156). For the simplicity of discussion, we disregard tense for the time being. Under the representation, the NP *ki* (the wood), internal argument of $horu_t$, is one of the arguments of the predicate ACT-ON. The variable (z) is an argument of BECOME in TELIC at NTS, which means the resultant is not specified truth conditionally. The verb may take some form of resultant by acting on the theme. As shown in the qualia structure, the NP *ki* (the wood) is in CONST at TS so that the phrase *ki-o-horu* presupposes the existence of the entity *ki*. The resultant of *ki* is relatively easily inferred through the variable of BECOME at NTS.

(159)
$$\begin{bmatrix} ki\text{-}o\text{-}horu_t \text{ (carve the wood) 木を彫る} \\ \text{ARG} = \Big[\text{ARG1: } x\Big] \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \Big[\text{CONST: ACT-ON } (x, [\![\text{ki}]\!])\Big] \\ \text{NTS} = \Big[\text{TELIC: } \exists z\text{BECOME [BE-AT } ([\![\text{ki}]\!], z)]\Big] \end{bmatrix} \end{bmatrix}$$

On the other hand, the verb phrase of *butsuzoo-o hotta* in the sentence like *Ken carved the statue of Buddha* with the creation sense of $horu_c$ of (158) can be represented as in (160). The NP *butsuzoo* is the element of BECOME in this case, which specifies the resultant. The entire verb phrase of *butsuzoo-o hotta* denotes that the statue of Buddha comes into being. Although the qualia structure contains the information of some kind of material for the object denoted by the NP, this

information is associated mainly with atelic state in a sentence like *Ken is carving the statue of Buddha* or related with some deictic expression in context. Like creation verbs such as *tateru* or *kaku*, a *horu*$_c$-type of verb make use of a D-ARG as an element of semantic well-formedness.

(160) $$\begin{bmatrix} \textit{butsuzoo-o horu}_c \text{ 仏像を彫る} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x, \text{ D-ARG:} y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: CAUSE ([ACT-ON } (x, y)], \text{ [BECOME [BE-AT } (y, [\![\text{butsuzo}]\!])]]) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The same approach can be applied to the other creation/transformation verbs such as *amu* (knit), *wakasu* (boil), and *nuu* (sew). In the case of *nuu*, the semantic representation is depicted as follows when the verb has a sense of transformation in the sentence like *Aiko sewed the silk fabric for three hours* in (153a) from the previous section.

(161) $$\begin{bmatrix} \textit{nuu}_t \text{ (sew)} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: ACT-ON } (x, y) \end{bmatrix} \\ \text{NTS} = \begin{bmatrix} \text{TELIC: } \exists z \text{BECOME (BE-AT } (y, z)) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

As a further supporting evidence, the verb *nuu*$_t$ does not generate a contradiction when the act of sewing is canceled as in (162a). In contrast, (162b) indicates that there is a contradiction when the completion of the action of sewing is canceled. In this case, the completion of the action requires a kind of resultant in the preceding sentence. It means that a variable (z) of the resultant in BECOME at NTS cannot be an antecedent since it is not specified truth conditionally. It only denotes some notion of resultant in BECOME non-truth conditionally.

(162) a. Aiko-ga siruku-no-kiji-o 3-jikan(-no-aida) nut-ta-kedo,
Aiko-NOM silk-GEN-fabric-ACC 3-hour(-GEN-for) sew-PAST-though
nue-nakat-ta.
sew-not-PAST
'Aiko sewed the silk fabric for three hours, but she did not sew it.
愛子がシルクの生地を 3 時間（の間）縫ったけど、縫えなかった。

b. *Aiko-ga siruku-no-kiji-o 3-jikan(-no-aida) nut-ta-kedo,
Aiko-NOM silk-GEN-fabric-ACC 3-hour(-GEN-for) sew-PAST-though
nuiagara-nakat-ta.
sew.finish-not-PAST

'Aiko sewed the silk fabric for three hours, but she did not finish sewing it.'
*愛子がシルクの生地を 3 時間（の間）縫ったけど、縫いあがらなかった。

Then, the phrase *siruku-no kiji-o nuu* is represented as follows. The resultant in this case is not specified truth-conditionally.

(163)
$$\begin{bmatrix} \textit{siruku-no-kiji-o nuu}_t \text{ (sew the silk fabric)} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: ACT-ON } (x, [\![\text{silk}]\!]) \end{bmatrix} \\ \text{NTS} = \begin{bmatrix} \text{TELIC: } \exists z \text{BECOME (BE-AT } ([\![\text{silk}]\!], z)) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

When this verb combines with a NP which denotes some product like a *cocktail gown* in the sentence like *Aiko sewed the cocktail gown in eight hours* of (155b) from the previous section, it has a sense of creation as well as telicity. In that case, the semantic representation is depicted as the following notation. The variable (y) degenerates into a D-ARG while a variable (z) of the resultant in BECOME has its position in ARG2, which is binded syntactically. The creation sense is specified in TS by combining the causing event of ACT-ON with the result event of BECOME in NTS with the help of CAUSE function.

(164)
$$\begin{bmatrix} \textit{nuu}_c \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } z \text{ (physical object)} \\ \text{D-ARG1: } y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, z))) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

In the case of nuu_c, the act of sewing also generates a contradiction when the action is negated as follows. The proposition of the action denoted by the verb is specified truth conditionally as in the semantic representation of (164). In the case of (165), the antecedent for the verb phrase *nuiagara-nakat-ta* is a cocktail gown in the preceding sentence, which is also specified truth conditionally in the semantic structure. The act of sewing denoted by the verb cannot be canceled in this case.

(165) *Aiko-ga kakuteru-doresu-o 8-jikan-de nut-ta-kedo, nuiagara-nakat-ta.
Aiko-NOM cocktail.gown-ACC 8-hour-in sew-PAST-though sew.finish-not-PAST
'Aiko sewed the cocktail gown in eight hours, but she did not finish sewing it.'
*愛子がカクテルドレスを 8 時間で縫ったけど、縫いあがらなかった。

The semantic representation of the expression *kakuteru-doresu-o nuu* in the sentence above is as illustrated below.

(166)
$$\begin{bmatrix} \textit{kakuteru-doresu-o nuu}_c \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{D-ARG1: } y \end{bmatrix} \\ \text{QUALIA} = \Big[\text{TS} = \Big[\text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, [\![\text{cocktail gown}]\!]))\Big]\Big] \end{bmatrix}$$

The verb nuu_c presents the existence of the cocktail gown or the completion of the event of sewing the gown. The two subevents are combined to specify a creation sense truth conditionally. The direct object *cocktail gown* contributes to the composition of a creation sense.

4.4 Summary

As we have seen so far, Japanese COS verbs will at least have the following three semantic classes:

(167) a. the *tateru/kaku* type of verb, which has only a sense of creation
b. the *horu* type of verb, which has a sense of creation and a transformation
c. the *samasu* type of verb, which has a sense of transformation, i.e. has a sense of resultant

The *tateru*-type verbs of creation sense and the *kaku*-type verbs of incremental themes contain the resultant with BECOME truth conditionally. Some other verbs of incremental themes like the verb *nomu* behave differently. They behave more like a *horu*-type verb. The *horu*-type verbs contain resultants with BECOME truth conditionally as well as non-truth conditionally. In this respect, they can take part in the object argument alternations and seem to take object arguments denoting resultants rather freely on the surface. *Nuu* (sew)-type verb in Japanese is in the same semantic class as a *horu*-type verb. In contrast, the English counterpart, *sew* is regarded as a manner verb Levin and Rappaport Hovav (2005) indicate. They assume that the manner verb like *sew* can composite complex event structure relatively freely compared with COS verbs like *break* and *cool*. Their claim of event compositionality is similar to the compositionality of a *horu*-type verb in Japanese.

Finally, *samasu*-type verbs contain the notion of a resultant truth conditionally. The resultants are generally determined by a lexical core meaning, i.e., root of the verbs. It is largely assumed that the telicity of this class is determined compositionally.

English counterparts of those Japanese COS verbs behave similarly. In that respect, our semantic representation system may capture their meanings more clearly. However, there should be more thorough research on those English counterparts, which we set aside for now for further research.

Chapter 5 Change of State Verbs and Two Relative Clauses

5.1 Introducdtion

After we have reviewed the previous studies about the two relative clauses, Change Relatives and Head-Internal Relative Clauses in Chapter 3, we take the same position as Nishigauchi (2004) following Hoshi (1995) and Shimoyama (1999) regarding HIRCs. We suggest that verbs that may occur in both relative clauses involve COS verbs. In the following chapter, we have examined the semantic nature of those COS verbs in a more broader sense of change. We propose some semantic representations to those COS verbs by applying the modified version of the qualia structure.

In this chapter, we scrutinize the nature of CRs by contrasting them with HIRCs. We will clarify the semantic nature of CRs by using the qualia structures of the verbs given in the previous chapter. We attempt to give a solution to our research questions:

(168) a. The interrelation between the post-relative *no* and interpretations of the two relative clauses, a CR and an HIRC involves a certain type of verb.

b. The semantic predicate BECOME plays an important role only in a CR meanwhile a syntactic contribution will be a key element for an HIRC.

We eventually can present the mechanism of CRs from the lexical semantic point of view by giving solution to the questions.

5.2 Change Relatives and Head-Internal Relative Clauses

After making a review of previous studies on both relative clauses, CRs and HIRCs, we have found two points that we should clarify. For one thing, a verb that occurs in a CR environment needs to have the semantic predicate BECOME so that it can have a sense of resultant[1]. Under a CR environment, the relative clause generally refers to this resultant in the lexical meaning of a verb. On the other hand, an HIRC environment needs to have a certain type of verb as one of the conditions. The verb should have a direct object argument which bears a theme role so that it can be a thetic focus for presenting an existence of the entity or eventuality that the direct object denotes.

[1]We define the second element of BECOME as *resultant* for representing both notions: a result state and a resultant object that a verb encode its lexical meaning in Chapter 4

5.2.1 Kinds of Verbs and Two Relative Clauses

Some of the verbs that usually occur in CRs from the data illustrated in Chapter 3 are *naru*, 'become,' *tokasu*, 'melt' or *wakasu*, 'boil.' First, the verb *naru* as in (169) in Chapter 3, which is cited here again, is a typical verb which contains the predicate BECOME among those verbs.

(169) [Otamajakushi-ga kaeru-ni nat-ta] {no (=yatsu)]-ga niwa-o
tadpole-NOM frog-COP become-PAST no (=thing)-NOM yard-ACC
hane-te-iru.
hop-COP-PROG
'A frog that is the result of changing from a tadpole is hopping in the yard.'
オタマジャクシが蛙になった{の（=やつ）}が庭を跳ねている。

As we consider a sentence *otamajakushi-ga kaeru-ni natta*, 'the tadpole became a frog,' in (169), the verb *naru* is an unaccusative verb, which involves an internally caused factor. It is natural development for a tadpole to be a frog because of inherent nature. The semantic representation of the verb is illustrated as in (170).

(170)
$$\begin{bmatrix} \textit{naru} \text{ (become) なる} \\ \text{ARG} = \begin{bmatrix} \text{ARG1:}x \\ \text{ARG2: } y \end{bmatrix} \\ \text{QUALIA} = \Big[\text{TS} = \Big[\text{CONST: BECOME (BE } (x, y))\Big]\Big] \end{bmatrix}$$

Based on the semantic representation of (170), the verb phrase *a tadpole became the frog* can be represented as follows. When this phrase is embedded in the CR as in (169), the post-relative *no* refers to the 'frog' of *Ni*-phrase in the relative clause. It means that the post-relative *no* refers to a resultant in BECOME, which is an ARG2 and is realized syntactically on the surface.

(171)
$$\begin{bmatrix} \textit{otamajakushi-ga kaeru-ni naru} \text{ (the tadpole becomes a frog)} \\ \text{QUALIA} = \Big[\text{TS} = \Big[\text{CONST: BECOME (BE } (\llbracket\text{tadpole}\rrbracket, \llbracket\text{frog}\rrbracket))\Big]\Big] \end{bmatrix}$$

Another verb which occurs in a CR is the verb *tokasu* as in the following example. This verb also involves BECOME. It is a COS verb and has a sense of resultant in its lexical meaning.

(172) John-wa [[bataa-o tokashi-ta]-no]-o pankeeki-ni kake-ta.
John-TOP butter-ACC melt-PAST-no-ACC pancake-DAT pour-PAST
'John pour the thing which was the result of melting butter over pancakes.'
ジョンはバターを溶かしたのをパンケーキにかけた。

As we can see from the following sentences, the verb *tokasu* can occur with a nondurative temporal expression. Without the temporal expression, it still has a sense of telicity. In both cases, the sentence usually means that the butter is all melted. However, the butter does not have to be all melted when it is used with a durative *for*-phrase. This suggests that the telicity seems to be determined compositionally. The verb *tokasu* behaves in a similar way to the verb *samasu* (cool) that we have discussed in Chapter 4. This suggests that the verb *tokasu* has the predicate BECOME rather truth conditionally.

(173) a. John-wa bataa-o {5-fun-de / ϕ} tokashi-ta.
John-TOP butter-ACC {5-minutes-in / } melt-PAST
'John melted butter (in 5 minutes).'
ジョンはバターを {5 分で / ϕ} 溶かした。

b. John-wa bataa-o 2-fun-kan hodo tokashi-ta.
John-TOP butter-ACC 2-minutes-for about melt-PAST
'John melted butter for about 2 minutes.'
ジョンはバターを 2 分間ほど溶かした。

The semantic representation of the verb is depicted as follows from the observation made above.

(174)
$$\begin{bmatrix} \textit{tokasu}\text{ (melt) 溶かす} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \left[\text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, \sqrt{TOK}))\right] \\ \text{NTS} = \begin{bmatrix} \text{TELIC: } TOK\ (y) \\ \text{AGENT: } \neg TOK\ (y) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The resultant of BECOME is obtained through the verb root, which is represented as $\sqrt{TOK}$, but the result state is not specified truth conditionally. The post-relative *no* in the CR with the verb *tokasu* refers to the resultant of BECOME, which is a melted butter whether or not it is all melted.

These examples show that a CR needs to have a verb that has the predicate BECOME in its lexical meaning. When a verb which contains BECOME appears in the relative clause, the post-relative *no* is treated as a pronominal. The *no* can refer to the resultant of BECOME by establishing the anaphora relationship with it. It does not matter whether or not the resultant is realized on the surface as long as it is encoded in the meaning of a verb.

On the other hand, the typical verbs that appear in an HIRC are those which denote existence such as *aru*, 'be' or change of location such as *mottekuru*, 'bring' as in (175) and (176). These sentences cannot be regarded as CRs since it is not natural for the post-relative *no* to be interpreted as a pronominal. The semantic properties of the direct objects in the relative clauses do not get any new sense of meanings from the verbs, compared with the characteristics of CRs. However, some native Japanese speakers may be able to accept the sentence of (176) as a CR, in which case the post-relative *no* can be regarded as a pronominal, probably because the verb 'bring' can have a sense of "change" in the location.

(175) Taro-wa [ringo-ga sara-no ue-ni at-ta {no / ??yatsu}]-o tot-te
Taro-TOP apple-NOM plate-GEN up-DAT be-PAST {No / one}-ACC pick.up-COP
tabe-ta.
eat-PAST
'Taro picked up the apples that were on the plate on the desk and ate them.'
太郎はリンゴが皿の上に あった { の / ??やつ } をとって食べた。

(176) Ken-ga [ringo-o motteki-ta {no / ??yatsu}]-o toridashi-te tabe-ta.
Ken-NOM apple-ACC bring-PAST {No / one}-ACC pick.out-COP eat-PAST
'Ken picked out the apples that he had brought and ate them.'
ケンがリンゴを持って来た { の / ??やつ } を取り出して食べた。

This kind of verb generally verifies the existence of the object as in (175) or the eventuality denoted by the verb and its object as in (176), in which case is a change of location. Both objects of the verbs in (175) and (176) are basically generated in the positions of the internal arguments of the verbs, which are direct objects (or subjects). It is a canonical position to get a thetic focus allowing a presentation of an entity or an eventuality that a verb with its direct object denotes.

The meaning of the verb, *aru* appeared in (175) can be represented as in (177) as it refers to a deictic object. It should contain the predicate BE (AT) for connoting a certain stative position. The state verb *aru* denotes the existence of the subject as it is without bringing about any changes.

(177)
$$\begin{bmatrix} \textit{aru}\ (\text{be})\ \text{ある} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } y \\ \text{ARG2: } z \end{bmatrix} \\ \text{QUALIA} = \Big[\text{TS} = \Big[\text{CONST: BE AT } (y, z)\Big]\Big] \end{bmatrix}$$

In the case of the verb, *mottekuru* appeared in (176) can be represented as in (178), considering the sense of completeness of the action of bringing. It should contain the predicate BE (AT) for

connoting some stative position. The verb denotes a change of location by relating the predicate BE (AT) with BECOME which is brought about by CAUSE.

(178)
$$\left[\begin{array}{l} \textit{mottekuru} \text{ (bring) 持ってくる} \\ \text{ARG} = \left[\begin{array}{l} \text{ARG1: } x \\ \text{ARG2: } y \\ \text{D-ARG1: } z \end{array}\right] \\ \text{QUALIA} = \left[\text{TS} = \left[\text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, z))\right)\right]\right] \end{array}\right]$$

As shown below, the verb cannot be compatible with the durative *for*-phrase whereas it can be compatible with nondurative *in*-phrase, which goes with BECOME. The (b) sentence cannot cancel the action of bringing an apple, either. The verb generates a contradiction in a sentence like *ringo-o motteki-ta-kedo, motteko-nakat-ta*, 'I brought an apple, but I did not bring it.'

(179) a. *Ken-ga ringo-o 10-pun-no-aida motteki-ta.
Ken-NOM apple-ACC 10-minutes-GEN-for bring-PAST
'Ken brought an apple for 10 minutes.'
*ケンがリンゴを 10 分の間持ってきた。

b. Ken-ga ringo-o 10-pun-de motteki-ta.
Ken-NOM apple-ACC 10-minutes-in bring-PAST
'Ken brought an apple in 10 minutes.'
ケンがリンゴを 10 分で持ってきた。

The predicate BECOME gives a sense of "change" to this verb as well as the end position, which is usually the same position as the agent. This sense of change may be one of the reasons that the sentence of (176) can be acceptable as a CR by some of the native speakers. The sentence is usually regarded as an HIRC, as we consider that the first argument of BECOME is realized syntactically as the direct object, which also bears a theme role of the verb *mottekuru*.

The following examples in (180) further support the plausibility of the thetic judgment analysis. When the thetic focus is realized in the relative clause followed by the particle *no*, the interpretation of a CR is not well-formed. In the case of *dasu*, 'take out' in (180), the semantic representation of the verb can be same as *mottekuru* represented in (178).

(180) a. HIRC

Taroo-ga [hana-o heya-kara dashi-ta no]-kara 1-rin morat-ta.
Taroo-NOM flower-ACC room-from take.out-PAST No]-from 1-CL be.given-PAST

'Taro took out the flower from the room and I was given one of them.'

太郎が花を部屋から出したのから 1 輪もらった。

b. CR

??Taroo-ga [[hana-o heya-kara dashi-ta] no(=yatsu)]-kara 1-rin
Taroo-NOM flower-ACC room-from take.out-PAST no(one)-from one-CL
morat-ta.
be.given-PAST

'Taro took out the flower from the room and I was given one of them.'

??太郎が花を部屋から出したの（=やつ）から 1 輪もらった。

Both verbs of *mottekuru* and *dasu* can contain the semantic predicate BECOME. When the end point in the predicate BECOME is focused in interpreting the verb phrase, the relative clause could be treated as a CR. Otherwise, it is treated as an HIRC because the theme object of the verb is syntactically realized as a direct object and the verb phrase represents the eventuality of the action denoted by the verb.

5.2.2 Existential Commitment and Head-Internal Relative Clauses

We now consider some of the typical verbs that are considered to be related with the thetic judgments. These verbs are *kaku*, 'write' and *araware(ru)*, 'appear,' etc. When this type of verb occurs in the relative clause in a certain construction, the construction can be treated as an HIRC, not as a CR. For example, the object *ronbun*, 'paper' of the verb, 'write' in the HIRC in (181a), which is the same one as cited in Chapter 3, presents the existence of the paper that a student wrote. This object, which is the thetic focus, also functions as the argument of the main verb *inyoosuru*, 'quote' in the matrix clause. In the case of (181b), the object of the verb *write*, *ronbun*, 'a paper' in the relative clause is the thetic focus meanwhile the head of the matrix clause is not this object, but *a student*, which is the agent of the verb *write* in the relative clause. The acceptability of the sentence as an HIRC is extremely low.

(181) HIRC

a. [Gakusei-ga syntax-no ronbun-o kai-ta {no / *yatsu}]-kara
student-NOM syntax-GEN paper-ACC write-PAST {No / one}-from
sensei-ga innyoshi-ta.
professor-NOM quote-PAST

'A student wrote a syntax paper and the professor quoted from it (=the paper).'

学生がシンタックスの論文を書いた { の /*やつ } から先生が引用した。
(Nishigauchi, 2004, 119: (29a))

b?*[Gakusei-ga syntax-no ronbun-o kai-ta no]-kara meeru-o morat-ta.
student-NOM syntax-GEN paper-ACC write-PAST No-from email-ACC get-PAST
'A student wrote a syntax paper and I got an email from her (=the student).'
?*学生がシンタックスの論文を書いたのからメールをもらった。
(Nishigauchi, 2004, 119: (29b))

The verb *kaku* is a creation verb and this type of verb predominantly has a telic reading. It does have an atelic reading when it is used in a progressive form like the verb *build* as we have discussed in Chapter 4. It is widely assumed that the argument of *write* is the incremental theme. When the incremental theme of the verb *kaku* does not need to be expressed as in the (a) sentence illustrated below, the telic reading is prioritized. In that case, the act of writing cannot be canceled. If it is negated, it shows a contradiction as in the (b) sentence. This contradiction is more apparent when a direct object is realized as in the (c) sentence.

(182) a. Kino-wa 1-jikan-de kai-ta.
yesterday-TOP 1-hour-in write-PAST
'Yesterday, I wrote in an hour.'
昨日は 1 時間で書いた。

b. ?Kino-wa 1-jikan-de kai-ta-ga, kanseishi-nakat-ta.
yesterday-TOP 1-hour-in write-PAST-but finish-NEG-PAST
'Yesterday, I wrote in an hour, but I didn't finish writing.
?昨日は 1 時間で書いたが完成しなかった。

c. *Kino-wa 1-jikan-de syntax-no-ronbun-o kai-ta-ga,
yesterday-TOP 1-hour-in syntax-GEN-paper-ACC write-PAST-but
kanseishi-nakat-ta.
finish-NEG-PAST
'Yesterday, I wrote a syntax paper in an hour, but I didn't finish writing. it
*昨日は 1 時間でシンタックスの論文を書いたが完成しなかった。

Considering these observations, it is represented as in (183), which is the same one as we have showed in Chapter 4. It encodes the telic aspect as well as the resultant truth-conditionally. The first argument of BECOME is needed for semantic well-formedness, but it is not necessarily realized

syntactically (Pustejovsky, 1995). The verb represents the existence of the resultant, which is also realized syntactically as a direct object.

(183) $$\begin{bmatrix} \textit{kaku} \text{ (write)} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } z \\ \text{D-ARG1: } y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, z))) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

When the verb *kau* takes the NP of *syntax-no ronbun* as in (181), its semantic representation is depicted as follows, which denotes a creation of a *syntax paper*.

(184) $$\begin{bmatrix} \textit{syntax-no ronbun-o kaku} \text{ (write a syntax paper)} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{D-ARG: } y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, [\![\text{syntax-no ronbun}]\!]))) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Once *kaku* gets a sense of creation by composition with the NP, *a syntax paper*, this NP acts as a theme role and is expressed as a direct object. When it appears in the relative clause followed with the *no*, the whole clause is interpreted as an HIRC.

The other type of verb that is related with the thetic judgment is unaccusative verbs such as *arawareru*, 'appear' as in (185a). *Gakusei*, 'a student' which is the argument of *appear* occurs in the place of nominative on the surface. It presents the event of an appearance of a student at the party. It also functions as the argument of the main verb in the matrix clause. In (185b), the argument *a student* of the unergative verb *work* is not the thetic focus despite of the fact that it implies the existence of a student. In the relation with the matrix clause, this argument *a student* is the one to be selected as the head for the main clause. However, *a student* is not regarded as the thetic focus within the relative clause so that the acceptability is far lower than (181a)[2]. The direct objects of the verbs in the relative clauses in both (a) and (b) sentences of (181) act at least as a theme role, which is one of the critical factors to be a thetic focus.

[2]The progressive form *(gakusei-ga) ronbun-o kait-eiru*, '(a student) is writing a paper' does not imply the existence of a paper; however, the expression *gakusei-ga hatarai-teiru*, 'student is working' can imply the existence of a student. Even the expression as *gakusei-ga hatarai-ta*, 'a student worked' can imply the sense of existence of a student. The verb *hataraku*, 'work' is uneargative and does not take an internal argument. The sentences exemplified in (181b) can improve its acceptability as an HIRC when the form of the verb in the relative clause is replaced with the phrase as *gakusei-ga hatarai-teiru*, 'a student is working'. This means that it will not be the matter of the judgment predication forms but the aspect of verbs. In terms of an inner argument, the functional category of the progressive may be projected as an upper layer.

(185) HIRC

a. [Gakusei-ga paati-ni araware-ta no]-kara meeru-o morat-ta.
student-NOM party-to appear-PAST No-from email-ACC get-PAST
'A student showed up at the party, and I got an email from her (=the student).'
学生がパーティーに現われたのからメールをもらった。
(Nishigauchi, 2004, 120:(30a))

b.??[Gakusei-ga konbini-de hatarai-ta no]-kara meeru-o morat-ta.
student-NOM convenience.store-at work-PAST No-from email-ACC get-PAST
'A student worked at a convenience stare, and I got email from her (=the student).'
??学生がコンビニで働いたのからメールをもらった。
(Nishigauchi, 2004, 120:(30b))

Then, when verbs which are not related with the thetic judgment occur in the relative clause with the post-relative *no*, what would be like the interpretation of such constructions? We first look into a kind of variant of creation verbs like *kaku*.

5.2.3 Change of State Verbs and Change Relatives

Unlike *kaku*, 'write' in the examples above, a sentence can be treated as a CR as in (186) when a verb that is unrelated to the thetic judgment such as *kakinaosu*, 'rewrite' occurs in the relative clauses. Tonosaki (1998) also shows an example of a CR with the same verb 'rewrite' as in (186b).

(186) CR

a. [[Gakusei-ga syntax-no ronbun-o kakinaoshi-ta] {no / yatsu}]-kara
student-NOM syntax-GEN paper-ACC rewrite-PAST no / one-from
sensei-ga innyooshi-ta.
professor-NOM quote-PAST
'The professor quoted from the paper that a student rewrote.'
学生がシンタックスの論文を書き直した { の / やつ } から先生が 引用した。

b. [[John-ga ronbun-o kakinaoshi-ta] no]-ga LI-ni not-ta.
John-NOM paper-ACC rewrite-PAST no-NOM LI-on appear-PAST
'The paper that John rewrote appeared in LC.'
John が論文を書き直したのが LI にのった。
(Tonosaki, 1998, 154: (33a))

This type of verb like *rewrite* can presuppose the existence of an entity that the direct object of the verb denotes. The result state is encoded truth-conditionally as well. The predicate BECOME

and its result state defined by the verb root gives a sense of transformation. The obvious result state is not involved in TS as the verb *samasu* (cool) or *tokasu* (melt), which we omit from the notation here and in the remains of the chapters unless it is necessary.

(187)
$$\begin{bmatrix} \textit{kaki-naosu} \text{ (rewrite)} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } y \end{bmatrix} \\ \text{QUALIA} = \Big[\text{TS} = \Big[\text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, \sqrt{NAO}))\Big]\Big] \end{bmatrix}$$

The same observation is possible with the following examples of (188a) and (188b).

(188) CR

a. Taroo-ga [[heya-o hana-de kazarinaoshi-ta] no]-o satsueishi-ta.
Taroo-NOM room-ACC flower-with redecorate-PAST no-ACC photograph-PAST
'Taro photographed the room which was redecorated with flower.'
太郎が部屋を花で飾り直したのを撮影した。

b. [[Taroo-ga heya-o rifoomushi-ta] no]-o satsueishi-ta.
Taroo-NOM room-ACC renovate-PAST no-ACC photograph-PAST
'Taro photographed the room which was renovated.'
太郎が部屋をリフォームしたのを撮影した。

As one of the interesting characteristics, the progressive form of *-teiru* as in (189a) can be accepted in the CR whereas the same form cannot be accepted in the HIRC as in (189b). One of the arguments that the progressive form is not allowed depends on whether or not the type of verb like *rewrite* presupposes the existence of some kind of an entity which the object of a verb denotes. Another argument is that the type of verb like *write*, which is a creation verb, can present the existence of an entity or event when the action of the verb completes in some sense.

(189) a. CR

[[Gakusei-ga syntax-no ronbun-o kakinaosi-teiru] {no / yatsu}]-kara
student-NOM syntax-GEN paper-ACC rewrite-PROG no / one-from
sensei-ga innyoshi-ta.
professor-NOM quote-PAST

'The professor quoted from the syntax paper that a student was rewriting.'
学生がシンタックスの論文を書き直している { の / やつ } から先生が引用した。

b. HIRC

*[Gakusei-ga syntax-no ronbun-o kai-teiru no]-kara sensei-ga
student-NOM syntax-GEN paper-ACC write-PROG No-from professor-NOM
innyoshi-ta.
quote-PAST

'A student was writing the syntax paper and the professor quoted from it.'

*学生がシンタックスの論文を書いているのから先生が引用した。

The following examples also show the same kind of argument discussed in the above. The progressive form can be acceptable in the CR. This leads to the assumption that a CR is relatively less restrictive than an HIRC.

(190) a. CR

?[[Taro-ga hana-o heya-ni kazarinaoshi-teiru] no]-kara 1-rin morat-ta.
Taro-NOM flower-ACC room-in arrange-PROG no-from 1-CL get-PAST

'I got one flower from those which Taro was rearranging with in a room.'

?太郎が花を部屋に飾り直しているのから 1 輪もらった。

b. HIRC

*[Taro-ga hana-o heya-ni kazat-teiru no]-kara 1-rin morat-ta.
Taro-NOM flower-ACC room-in arrange-PROG No-from 1-CL get-PAST

'Taro was arranging some flower in a room, and I got one flower from among them.

*太郎が花を部屋に飾っているのから 1 輪もらった。

In sum, a verb with transformation sense which often occurs in a CR is likely to induce presupposition of the entity denoted by the direct object whereas a verb with a thetic focus NP occurred in the HIRC is not. Under the CR environment, the post-relative *no* always refers to a resultant of BECOME, not a theme argument of it although both arguments are encoded in the meaning of a verb. CRs are also insensitive to the progressive aspect in contrast with HIRCs.

5.3 Mechanism of Two Relative Clauses

5.3.1 Creation/Transformation and Two Relative Clauses

We have seen that the verbs of change of location may give an ambiguous interpretation when they appear in a relative clause followed by the particle *no*. If a sense of change is stressed in interpreting a verb phrase, the relative clause in which the verb occurs is likely to be regarded as a CR. If a sense of motion is stressed or a direct object is more focused as a thetic focus, the relative clause

is considered to be an HIRC. The other type of verb that gives clear notion for the interpretation of HIRCs is a creation verb, which is one of the COS verbs. The verbs of creation represent an existence of the entity that they bring about. Either type of verb has a direct theme object, which is a thetic focus under an HIIRC environment. Such a direct object is always a theme argument of BECOME in TS. In short, the argument is truth conditionally encoded in the meaning of a verb.

What if a COS verb with transformation sense occur in the relative clause followed with the particle *no*? Such a relative clause is usually treated as a CR as indicated in the cases in the previous sections. When the verbs like *(kaeru-ni) naru*, *tokasu*, and *kakinaosu* occur in the relative clauses, the post-relative *no* refers to the resultant of BECOME in TS whether or not it is explicitly realized on the surface. In other words, the resultant is encoded truth conditionally in the meaning of a verb. Even though a direct object of the verb *kaki-naosu*, 'rewrite' or the verb *kazari-naosu*, 'rearrange' bears a theme role, it cannot be a theic focus. This type of verb presupposes the existence of its direct object when they take it as an internal argument. The objects of these verbs undergo a transformation from one property to another one by the action denoted by the verbs.

Considering the *kaku*-type of creation verb and its variant like *kaki-naosu*, Japanese has some COS verbs that shift their meanings between the two senses: creation and transformation. Among such verbs, we have some verbs like *horu*, 'carve' and *amu*, 'knit.' We now look into these verbs when they appear in the relative clauses ended with the particle *no*.

In contrast with the *kaki-naosu* type of verbs, the verb *horu*, 'carve' can take two different types of NPs such as *ki*, 'wood' or *butsuzoo*, 'statue of Buddha' as shown in (191) and (192), respectively. The meaning of the verb shifts its meaning between transformation sense and creation sense depending on the type of NP. When the verb *horu* takes a NP 'wood' as its internal argument in (191), the entire sentence is treated as a CR. On the other hand, when the same verb takes a NP 'statue of Buddha' as its internal argument in (192), the sentence is treated as an HIRC.

(191) CR

Ken-wa [[ki-o hot-ta] {no / mono}]-o kannso-sase-ta.
Ken-TOP wood-ACC carve-PAST no / thing-ACC dry-make-PAST

'Ken dried the thing that he carved.'
ケンは木を彫った { の / もの } を乾燥させた。

(192) HIRC

Ken-wa [butsuzoo-o hot-ta {no / *mono}]-o kannso-sase-ta.
Ken-TOP Buddha.statue-ACC carve-PAST {No / thing}-ACC dry-make-PAST

'Ken carved the statue of Buddha and dried it.'
ケンは仏像を彫った{ の / *もの }を乾燥させた。

The lexical semantic representation of *horu* with a transformation sense, which we discuss in Chapter 4, is depicted as follows.

(193) $$\begin{bmatrix} horu_t \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: ACT-ON } (x, y) \end{bmatrix} \\ \text{NTS} = \begin{bmatrix} \text{TELIC: } \exists z \text{ BECOME (BE-AT } (y, z) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

With the lexical semantic representation of $horu_t$, the phrase *Ken-wa ki-o horu* of (191) is represented as follows. The resultant is not specified truth conditionally even though the verb contains a sense of transformation with the predicate BECOME. When the verb phrase occurs in the relative clause, the post-relative *no* refers to the resultant of BECOME in TELIC at NTS.

(194) $$\begin{bmatrix} \textit{Ken-wa ki-o } horu_t \text{ (Ken carves the wood)} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: ACT-ON } (\llbracket \text{Ken} \rrbracket, \llbracket \text{ki} \rrbracket) \end{bmatrix} \\ \text{NTS} = \begin{bmatrix} \text{TELIC: } \exists z \text{ BECOME (BE-AT } (\llbracket \text{ki} \rrbracket, z)) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

On the other hand, the verb *horu* with a creation sense is represented as follows from Chapter 4.

(195) $$\begin{bmatrix} horu_c \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } z \\ \text{ARG2: } z \\ \text{D-ARG1: } y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, z))) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

With the lexical semantic representation of $horu_c$, the verb phrase of *Ken-wa butsuzoo-o horu* is represented as follows. The semantic predicate [BECOME (y, ⟦butsuzoo⟧)] represents a sense of creation, which means that the entity comes into being by the acting of *horu*, 'carving.' It is not possible to single out the first argument of BECOME. Even if the LCS of the verb has a complex structure, it represents a single event. The resultant is realized as a direct object syntactically. This direct object gets a thetic focus when the verb phrase occurs in the relative clause followed with the particle *no*.

(196) $\left[\begin{array}{l} \textit{Ken-wa butsuzoo-o horu} \text{ (Ken carves the statue of Buddha)} \\ \text{ARG} = \left[\text{D-ARG: } y\right] \\ \text{QUALIA} = \left[\text{TS} = \left[\text{CONST: CAUSE ([ACT-ON ([[Ken]], } y\text{)], [BECOME [BE-AT (}y\text{, [[butsuzoo]])]])}\right]\right] \end{array}\right]$

As another example of the verbs involved in the creation and transformation alternation, the following verb *wakasu*, 'boil' can be analyzed in the same way as (191) and (192). When the argument of the verb *wakasu* in the relative clause is *mizu*, 'water' as in (197), the whole sentence can be treated as a CR. In the case of (198), when the internal argument is replaced water with *yu*, 'hot water', the sentence is treated as an HIRC.

(197) CR

Mary-wa [[mizu-o wakashi-ta] no(=yatsu)]-o kyuusu-ni sosoi-da.
Mary-TOP water-ACC boil-PAST no(thing)-ACC teapot-into pour-PAST

'Mary poured the water that she boiled into a teapot.'
メアリーは水を沸かしたの（= やつ）を急須に注いだ。

(198) HIRC

Mary-wa [yu-o wakashi-ta {no / ??mono}]-o kyuusu-ni sosoi-da.
Mary-TOP hot.water-ACC boil-PAST {No / ??thing}-ACC teapot-into pour-PAST

'Mary boiled the hot water and poured it into a teapot.'
メアリーは湯を沸かした { の / ??もの } を急須に注いだ。

In both cases of (191) and (197), if a verb with transformation sense is used in a CR environment, the post-relative *no* is regarded as a pronominal, which positions in the head of the NP in the matrix clause. The first (theme) argument of BECOME can be the basis for presupposition of the existence of the entity that the direct object denotes. The psot-relative *no* refers to the resultant of BECOME in NTS at the indirect semantic level. On the other hand, the direct object which is the syntactically realized resultant of BECOME gets a thetic focus so that the relative clause is treated as an HIRC.

Some other examples such as follows can be analyzed in the same way as we have discussed in the above. The difference in the type of noun phrase plays a key role in treatment of the interpretations of CRs and HIRCs.

(199) a. CR

Ken-wa [[tsuchi-o hot-ta] no]-no-naka-ni hooseki-o ire-ta.
Ken-TOP earth-ACC dig-PAST no-GEN-inside-LOC jewelry-ACC put.in-PAST

'Ken put some jewelries in the thing that is the result of the earth that he dug.'
健は土を掘ったのの中に宝石を入れた。

b. HIRC

Ken-wa [ana-o hot-ta {no / *mono}]-no-naka-ni hooseki-o
Ken-TOP hall-ACC dig-PAST {No / thing}-GEN-inside-LOC jewelry-ACC
ire-ta.
put.in-PAST

'Ken dug a hall and put some jewelries in it.'
健は穴を掘った { の / *もの } の中に宝石を入れた。

(200) a. CR

Aiko-wa [[keito-o an-da] no]-o tatan-de keesu-ni ire-ta.
Aiko-TOP wool.yarn-ACC knit-PAST no-ACC fold-COP case-in put.away-PAST

'Aiko put away the thing that is the result of the wool yarn that she knitted in the case.'
愛子は毛糸を編んだのを畳んでケースに入れた。

b. HIRC

Aiko-wa [seetaa-o an-da no / *mono)}]-o tatan-da keesu-ni
Aiko-TOP sweater-ACC knit-PAST {No / thing}-ACC fold-COP case-in
ire-ta.
put.away-PAST

'Aiko knitted a sweater and put it away in the case.'
愛子はセーターを編んだ { の / *もの } を畳んでケースに入れた。

(201) a. CR

Aiko-wa [[reesu-no-kiji-o nut-ta] no]-o shichakushi-ta.
Aiko-TOP lace-GEN-cloth-ACC sew-PAST no-ACC put.on-PAST

'Aiko put on the thing that is the result of a lace fabric that she sewed.'
愛子はレースの生地を縫ったのを試着した。

b. HIRC

Aiko-wa [koukana-kiji-no-suutsu-o nut-ta {no / *mono}]-o
Aiko-TOP expensive-fabric-GEN-suit-ACC sew-PAST {No / thing}-ACC
shichakushi-ta.
put.on-PAST

'Aiko sewed a suit out of the expensive fabric, and put it on.'

愛子は高価な生地のスーツを縫った { の / *もの } を試着した。

All (a) sentences in the examples above can be treated as CRs because of the type of a NP occurred as an internal argument of each verb. These NPs denote some kind of materials, which can presuppose the existence of such materials when they combine with verbs of transformation sense. When such a verb like *horu* occurs in the relative clause, the post-relative *no* refers to the resultant of BECOME, which is encoded non-truth conditionally. On the other hand, all (b) sentences can be treated as HIRCs since the event or entity is asserted by the verb with its direct object. When a verb with a creation sense occurs with the NP denoting a product, the resultant of BECOME is realized as the direct object on the surface. The relative clause with such a verb can be treated as an HIRC.

5.3.2 The Status of the Post-Relative *NO* and Two Relative Clauses

As we have seen so far, the *horu* type of verb can have two meanings, a creation sense and a transformation sense depending on a kind of NP that a verb combines with. When such a verb appears in a CR as well as an HIRC, the interpretation of the two relative clauses differs from each other. The *horu*-type verb with a transformation sense encodes telicity aspect non-truth conditionally meanwhile the other type with a creation sense encodes it truth conditionally. What if a valuable in TELIC of $horu_t$-type of transformation verbs is specified? Do those verbs function as a verb of creation? Are relative clauses treated as HIRCs when the transformation type of verb occurs in the relative clauses?

First, we consider the verb *taku*, 'cook' that can shift its meanings between creation and transformation as in (202) by replacing its direct object between two kinds of nouns: *kome*, 'rice' and *gohan*, 'cooked rice.' Under our anlaysis, the sentence is treated as a CR when the direct object of *taku* is rice as in (202a) whereas it is treated as an HIRC when the object is cooked rice as in (202b).

(202) a. CR

[[Kome-o tai-ta] no]-no ue-ni tamago-o kake-te tabe-ta.
rice-ACC cook-PAST no-GEN on-LOC egg-ACC put-COP eat-PAST

'I put an egg on the stuff that I cooked (raw) rice and ate it.'
米を炊いたのの上に卵をかけて食べた。

b. HIRC

[Gohan-o tai-ta] no]-no ue-ni tamago-o kake-te tabe-ta.
cooked.rice-ACC cook-PAST No-GEN on-LOC egg-ACC put-COP eat-PAST

'I cooked rice, and I put an egg on and ate it.'
ご飯を炊いたのの上に卵をかけて食べた。

With this view in mind, we now examine the cases where valuables in TELIC are specified as in (203). In a CR environment, BECOME is the key factor to obtain a sense of resultant whereas a syntactic realization of a direct theme argument is the critical element in an HIRC environment.

(203)
$$\begin{bmatrix} \textit{kome-o paeria-ni tai-ta} \text{ ('cook rice and make paella')} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: CAUSE(ACT-ON } (x, [\![\text{kome}]\!]), \text{ BECOME (BE-AT } ([\![\text{kome}]\!], [\![\text{paeria}]\!]))) \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

In the case of (204a), the post-relative *no* can be replaced with pronominal such as *yatsu*, 'thing' or *mono*, 'stuff.' The verb *taku* in this case act as a transformation verb due to the *Ni*-phrase of *paeria-ni*, which is not a direct object. The post-relative *no* can refer to the resultant, *paeria* (paella) as the sentence with the verb *naru* of *kaeru-ni naru*, 'become a frog' in (169) in the section 5.2.1. The (a) sentence of (204) is regarded as a CR although the verb *taku* encodes telicity and a resultant truth conditionally. Besides, the resultant is not appeared as a direct object on the surface.

Under the CR construction, the resultant is always prioritized for interpretation whether it is encoded truth-conditionally or non-truth conditionally. Inside the relative clause, the object NP presupposes the existence of the entity, rice. Then, the meaning of the entity undergoes so-called semantic change by the verb in the sense of Tonosaki (1998). In other words, the post-relative *no* takes the NP *paeria* of the expression *kome-o paeria-ni tai-ta* as an explicit antecedent when it is realized on surface. This kind of anaphora is one of the characteristics of pronominal.

When a resultant of the transformation sense verb is not realized explicitly as in (204b), it will be obtained through TELIC of non-truth conditional level within the verb as the verb *horu* which is discussed in the previous section. In both conditions, the key factor is that a verb in a CR should have the predicate BECOME in its lexicon. The post-relative *no* in a CR always refer to the resultant of the predicate BECOME.

(204) a. CR with an explicit resultant

[Takai kome-o paeria-ni tai-ta] no]-no dekibae-wa subarashikat-ta.
expensive rice-ACC paella-Ni cook-PAST no-GEN result-TOP fantastic-be-PAST
'The result of paella that I cooked with an expensive rice was fantastic.'
高い米をパエリアに炊いたのの出来栄えは素晴らしかった。

b. CR with an implicit resultant

[Takai kome-o tai-ta] no]-no dekibae-wa subarashikat-ta.
expensive rice-ACC cook-PAST no-GEN result-TOP fantastic-be-PAST
'The result of the thing that I cooked an expensive rice was fantastic.'

高い米を炊いたのの出来栄えは素晴らしかった。

Assuming that a verb in an HIRC environment requires a theme object, what if we construct an HIRC from the sentence of (204a) by making the direct object to be a theme of the matrix clause? As shown in the following example, the acceptability of the sentence as an HIRC is not good, but it is not so bad as if the sentence is interpreted as a CR. When the post-relative *no* is regarded as a pronominal like *mono*, the sentence is not acceptable. This suggests that the post-relative *no* in the HIRC and the one in the CR is not the same type. At least the post-relative *no* in the HIRC is not regarded as a pronominal.

In addition, the direct object '(uncooked) rice' may get a thetic focus by the verb *kau* (buy) in another embedded relative clause. In this way, the direct object, (uncooked) rice is foreground syntactically, i.e., that is a thetic focus.

(205) ?[Ikari suupaa-de kat-ta kome-o paeria-ni tai-ta
Ikari supermarket-at buy-PAST uncooked.rice-ACC paella-Ni cook-PAST
{no / *mono}]-no meigara-wa koshihikari-dat-ta.
{No / thing}-GEN brand-TOP koshihikari-be-PAST
'I cooked an rice which I bought at the Ikari supermarket and made paella from it, whose brand was *koshihikari*.'
?イカリスーパーで買った米をパエリアに炊いた{の / *もの}の銘柄はコシヒカリだった。

When an embedded clause is placed between the direct object and the post-relative *no* as in (206), the sentence is totally accepted as an HIRC. In this case, something related with sentence processing or any other language processing might be a key factor for improving the acceptability.

(206) [Kome-o tai-te oishiku tabe-ta {no / *mono}]-no meigara-wa
uncooked.rice-ACC cook-COP enjoy eat-PAST {No / thing}-GEN brand-TOP
koshihikari-dat-ta.
koshihikari-be-PAST
'I cooked an rice and enjoyed eating it, whose brand was *koshihikari*.'
米を炊いておいしく食べた{の / *もの}の銘柄はコシヒカリだった。

Then, let us consider the following sentence. This is a natural sentence but consists of two sentences combined with a linking phrase. The post-relative *no* in the second sentence is regarded as a pronominal. This *no* refers to "rice" in the first sentence. The post-relative *no* in (207) is the same type as the one occurs in a CR.

(207) Asoko-no 3-tsu-no meigara-no(-kome-no)-uchi, [paeria-ni
over.there-GEN 3-CL-GEN brand-GEN(-rice-GEN)-among paella-Ni
tai-ta]-no]-no meigara-wa koshihikari dat-ta.
cook-PAST-no-GEN brand-TOP koshihikari-be-PAST

'Among the 3 brands (of rice) over there, I made a paella from one of them, whose brand was *koshihikari*.'
あそこの 3 つの銘柄の（米の）うち、パエリアに炊いたのの銘柄はコシヒカリだった。

The similar observations about (204a) and (205) can be made about (208a) and (208b), respectively. In (208a), the head noun in the matrix clause, *hadazawari*, which roughly means 'the texture' seems to refer to the resultant NP, sweater in the CR as the first part of the expression of *-no hadazawari*, 'the texture of' in the matrix clause. The NP sweater inside the relative clause is an resultant of BECOME of the verb, knit. If the resultant is not realized as in the sentence like *Aiko-wa keito-o an-da no*, 'the result of the wool yarn that Aiko knitted,' it can be inferred from the resultant of BECOME at TELIC of the verb with a transformation sense.

However, the *no* in (208b) cannot be regarded as a pronominal. If it is interpreted as such, the sentence should be treated as a CR. On the contrary, the sentence is not acceptable as a CR. It is rather regarded as an HIRC. The direct object 'a wool yarn with various colors' of the verb 'knit' with the verb *kau* in another embedded clause contributes syntactically to the interpretation of an HIRC.

(208) a. CR

[[Kireina iro-no keito-o seetaa-ni an-da] no]-no hadazawari-wa
pretty color-GEN wool.yarn-ACC sweater-Ni knit-PAST no-GEN texture-TOP
yokat-ta.
nice-be-PAST

'The texture of the sweater that I knitted from a pretty color of wool yarn was nice.'
きれいな色の毛糸をセーターに編んだのの肌触りはよかった。

b. HIRC

?[Shugei-no-marujyu-de kat-ta iroirona iro-no keito-o seetaa-ni
shugei-no-marujyu-at buy-PAST various color-GEN wool.yarn-ACC sweater-Ni
an-da {no / *mono}]-no nagasa-wa 50-meetaa dat-ta.
knit-PAST {No / thing}-GEN length-TOP 50-meter be-PAST

'I knitted wool yarn with various colors which I bought at Hobby House Marujyu and made a sweater from it, length of which was 50 meters long.'
?手芸の丸十で買った色々な色の毛糸をセーターに編んだ{ の / *もの } の長さは 50 メートルだった。

As we argue in the above of (206), the sentence in (209) can be also accepted as an HIRC. The expression *akarui-iro-de* may affect the verb *amu*, 'knit' in the relative clause. The focus in the relative clause seems to shift from the resultant of the verb, knit to the direct object, a wool yarn.

(209) HIRC

[Keito-o akarui-iro-de seetaa-ni an-da] {no / *mono}]-no nagasa-wa
wool.yarn-ACC bright-color-with sweater-Ni knit-PAST {No / thing}-GEN length-TOP
50-meetaa dat-ta.
50-meter be-PAST

'I knitted a wool yarn with a bright color into a sweater, the length of which was 50 meters long.'
毛糸を明るい色でセーターに編んだ{ の / *もの }の長さは 50 メートルだった。

Both (208b) and (209) indicate that the status of the post-relative *no* is not the same as the one in a CR. The following example also supports the hypothesis that the post-relative *no* in an HIRC is not a pronominal as the one in a CR. The post-relative *no* in the second sentence of the following example is a pronominal.

(210) Kago-no-naka-no 5-shoku-no-keito no-uchi, [[seetaa-ni
basket-GEN-inside-GEN 5-color-GEN-wool.yarn GEN-among sweater-Ni
an-da]-no]-no iro-wa kuroiro dat-ta.
knit-PAST-no-GEN color-TOP black be-PAST
'Among five colors of the wool yarns in a basket, the color of which I knitted into sweater was black.'
籠の中の 5 色の毛糸のうち、セーターに編んだのの色は黒色だった。

Finally, in the case of *horu* in (211a), the post-relative *no* acts as a pronominal, which is replaceable with a light pronoun such as *mono*, 'thing.' It seems to refer to the resultant NP *butsuzoo*, 'the statue of Buddha' within the relative clause as a part of the head NP in the matrix clause. Even though it is not realized as a resultant in the sentence like in (211a), the post-relative *no* can function as a pronominal and refer to some implicit resultant in a CR environment. That is the resultant of BECOME in the meaning of the verb $horu_t$.

On the other hand, the post-relative *no* in (211b) may refer to the direct object NP 'expensive wood' inside the relative clause though the sentence acceptability is rather marginal. The direct object seems to be focused as foregrounded information. The post-relative *no* again is not regarded as a pronominal when the sentence is treated as an HIRC. If it is intended to treat as a CR, it is not acceptable. In the case of (211c), an embedded clause is the key factor for the sentence to be treated as an HIRC, The sentence in (211c) may be a little more acceptable than the sentence in (211b). The interpretation of an HIRC in both sentences may be related with syntactic and linguistic processing factors. We will not go further on this matter about HIRCs in this dissertation since it derails from our research objectives.

(211) a. CR

Ken-ga [ki-o butsuzoo-ni hot-ta {no / mono}]-no
Ken-NOM wood-ACC Buddha.statue-Ni carve-PAST {no / thing}-GEN
hyojoo-ga subarashika-ta.
facial.expression-NOM fantastic-PAST

'The face of the statue of Buddha that Ken carved the wood into was fantastic.'

ケンが木を仏像に彫った { の / もの } の表情が素晴らしかった。

b. HIRC

??Ken-wa [kookana ki-o butsuzoo-ni hot-ta {no / *mono}]-no
Ken-TOP expensive wood-ACC Buddha.statue-Ni carve-PAST {No / thing}-GEN
kezurikasu-o moyashi-ta.
wood.waste-ACC burn-PAST

'Ken carved a expensive wood and made the statue of Buddha from it, waste of which he burnt.'

??ケンは高価な木を仏像に彫った { の / *もの } の削りかすを燃やした。

c. HIRC

?Ken-wa [ki-o usuku-shi-te butsuzoo-ni hot-ta {no / *mono}]-no
Ken-TOP wood-ACC thin-be-COP Buddha.statue-Ni carve-PAST {No / thing}-GEN
kezurikasu-o moyashi-ta.
wood.waste-ACC burn-PAST

'Ken reduced the thickness of a wood and carved the statue of Buddha from it, waste of which he burnt.'

?ケンは木を薄くして仏像に彫った { の / *もの } の削りかすを燃やした。

The post-relative *no* in a CR of (211a) is the same category as the one in the following sentence. All of these observations we have made so far will reach to the conclusion that the post-relative *no* is a pronominal in a CR.

(212) Tenpiboshi-shi-ta 5-hon-no mokuzai-no-uchi, [butsuzoo-ni hot-ta
dried.in.the.sun-be-PAST 5-GEN wood-GEN-among statue.Buddha-Ni carve-PAST
no]-no kezurikasu-o moyashi-ta.
no-GEN wood.waste-ACC burn-PAST

'Among five timbers which had been dried in the sun, I burnt the wood waste of the one carved into the statue of Buddha.'

天日干しした 5 本の木材のうち、仏像に彫ったのの削りかすを燃やした。

As one last example, we look at some unaccusative verbs. Unaccusative verbs like *arawareru* is a typical verb for thetic focus as Nishigauchi (2004) claims. When such a verb occurs in the relative clause, the sentence is treated as an HIRC as in the (a) sentence of (185), which is cited here again as in (213).

(213) HIRC

[Gakusei-ga paati-ni araware-ta no]-kara meeru-o morat-ta.
student-NOM party-to appear-PAST No-from email-ACC get-PAST

'A student showed up at the party, and I got an email from her (=the student).'
学生がパーティーに現われたのからメールをもらった。

The lexical semantic representation of the verb *arawareru* is illustrated as in (214a), which is an achievement verb as English verb *appear*. The theme argument of BECOME is a thetic focus in the event of a student appearing at the party. The post-relative *no* in the HIRC of (213) refers to this argument of BECOME, which is realized as the subject syntactically.

(214) a. $\begin{bmatrix} \textit{arawareru} \text{ (appear) 現われる} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } z \text{ (location)} \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: BECOME (BE-AT } x, z) \end{bmatrix} \end{bmatrix} \end{bmatrix}$

b. $\begin{bmatrix} \textit{gakusei-ga paati-ni arawareru} \text{ (a student appears at the party) 学生がパーティーに現れる} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \begin{bmatrix} \text{CONST: BECOME (BE-AT } [\![\text{gakusei}]\!], [\![\text{paati}]\!]) \end{bmatrix} \end{bmatrix} \end{bmatrix}$

Now, let us consider the verb, *tokeru*, 'melt' in the following sentence in (215). The condition of being a subject with a theme role is fulfilled for a thetic focus. Despite that, the sentence is likely to be regarded as a CR.

(215) CR

Tennen-no-koori-ga toke-ta-no-o gurasu-ni ire-ta.
natural-GEN-ice-ACC melt-PAST-no-ACC glass-DAT pour-PAST

'I put the thing that natural ice melted in a glass.'
天然の氷が溶けたのをグラスに入れた。

This verb is similar to the verb *samasu*, a COS verb with a transformation sense. The intransitive form of the verb *tokasu* we have examined in Section 5.2.1. The *samasu*-type verb encodes its

resultant truth conditionally as an inchoative state. The semantic representation is depicted as in (216).

(216)
$$\left[\begin{array}{l} \textit{tokeru} \text{ (melt) 溶ける} \\ \left[\begin{array}{ll} \text{ARG} = \left[\text{ARG1: } x\right] & \\ \text{QUALIA} = \left[\begin{array}{l} \text{TS} = \left[\text{CONST: BECOME (BE-AT } (x,\ \sqrt{TOK})\right] \\ \text{NTS} = \left[\begin{array}{l} \text{TELIC: } \textit{TOK}\ (x) \\ \text{AGENTIVE: } \neg\ \textit{TOK}\ (x) \end{array}\right] \end{array}\right] & \end{array}\right] \end{array}\right]$$

As an unaccusative verb like *arawareru*, the verb *tokeru* contains the same semantic components of BECOME as in (216). However, the post-relative *no* in the CR of (215) does not refer to the same argument in BECOME as the *no* in the HIRC with the verb *arawareru*. The CR of (215) refers to the resultant of BECOME as shown in the following semantic representation while the HIRC of (213) refers to the theme argument.

(217)
$$\left[\begin{array}{l} \textit{koori-ga tokeru} \text{ (the ice melts) 氷が溶ける} \\ \text{QUALIA} = \left[\text{TS} = \left[\text{CONST: BECOME (BE-AT } (\llbracket\text{koori}\rrbracket,\ \sqrt{TOK})\right]\right] \end{array}\right]$$

When a transformation sense of verb is chosen in the relative clause, the whole structure is likely to be regarded as a CR. The post-relative *no* always refers to a resultant in the CR environment whether or not it is realized on the surface structure. If it is not realized explicitly, it can be easily inferred on the assumption that it is encoded in the lexical meaning of a verb. This leads to the conclusion that a sense of change is related with the semantic predicate BECOME. The BECOME is the key factor for interpretation of CRs. On the other hand, an HIRC seems to take either type of object whether it denotes material or a resultant as long as such an object is realized as a direct object of a verb and gets a thetic focus.

To sump up, the interpretation of the CR seems to involve the predicate BECOME of verbs that occur in the relative clauses. CRs prefer to take a verb that has the predicate BECOME in its meaning either truth-conditionally or non-truth conditionally. The type of noun phrase is also a key factor for constructing a CR. It usually denotes material or something that is not artificial.

In the CR environment, the post-relative *no* always refers to a resultant when a verb with the predicate BECOME occurs in the relative clause. The *no* act as a pronominal and is base generated in the head NP in the matrix clause. When a sense of change is focused on for interpreting the relative clause embedded with a verb involving BECOME, the CR construction is prioritized.

As Kuroda (1992b) suggests, the HIRC has certain constraints to be treated as such. It is now assumed that the predicate BECOME is not critical in the HIRC environment. Verbs with the

predicate BECOME can occur in the HIRC, however, it is not a resultant that is concerned in the environment. The post-reltavie *no* is linked with the internal NP that is the direct theme argument of the verb in the relative clause. Such a object needs to be a thetic focus so that it can be prioritized as the internal head of the matrix clause.

5.4 Summary

In this chapter, we present a theoretical analysis on CRs by contrasting with HIRCs. We exhibit some empirical evidences to show that the interrelation between the relative clause and the post-relative *no* of the two relative clauses. The evidences show that the most prominent factor of the interrelation between the two relative clauses involves the semantic predicate BECOME of verbs occurred in the relative clauses. When a verb which contains BECOME acts as a verb of transformation in the relative clause, the entire clause is likely to be treated as a CR. Under the CR construction, the post-relative *no* is initially positioned in the head of NP in the matrix clause. When the verb acts as a verb of creation or a verb involving a thetic focus condition, the structure is likely to be treated as an HIRC. Under the HIRC construction, the post-relative *no* is basically positioned in the head of CP.

A CR environment usually chooses a type of COS verb that contains the semantic predicate BECOME. The post-relative *no* always refers to a resultant of BECOME regardless of the condition that the predicate BECOME is encoded truth-conditionally or non-truth conditionally. In this regard, the CR prefers the construction of having the post-relative *no* as a pronominal. On the other hand, the HIRC environment does not concern much about a resultant of BECOME. It prefers to take a theme argument as long as it is realized syntactically as a direct object (a subject) even if it is not a theme argument of BECOME. A syntactic contribution will be a key element for interpretation of an HIRC. As we have seen that the acceptability of HIRCs will improves when some expressions are inserted before the relative clause or between the internal head and the post-relative *no*. It may be related with a syntactic factor or a sentence processing or any other language processing factors, or both. Further research on this matter should be necessary to clarify the mechanism of HIRCs.

Chapter 6 Conclusions

This chapter shows the summary of our claims under three themes. In Section 6.1, the main questions and conclusions will be recapitulated. In Section 6.2, we explain about some advantages and practical implications on our theoretical approaches. In Section 6.3, some remaining problems are illustrated for further studies.

6.1 Summary of the Claims

What we have argued in the dissertation is to clarify the following two distinctive characteristics about the two relative clauses: Change Relatives and Head-Internal Relative Clauses.

(218) a. The post-relative *no* can be pronominal when the object noun phrase within the relative clause gets a new sense of meaning with some kind of factors.

b. The post-relative *no* can be a complementizer when the object noun phrase within the relative clause hold the same meaning as that of the relative clause with the *no*.

After we have made comprehensive review of various data from the previous studies, we assume that the status of the post-relative *no* differs between the two relative clauses when a certain type of verb appears in a relative clause. We observe that the interpretation of a relative clause is related with the following type of verbs.

(219) a. A change of state verb is preferred in an CR construction. The verb has the semantic predicate BECOME.

b. A verb that has a theme argument as the direct object is preferred in an HIRC construction. The verb can allow a thetic judgment.

As a first step, we have conveyed a thorough research on the semantic nature of COS verbs in oder to reveal the mechanism of CRs. It may be taken for granted that a COS verb appears in a CR as Hiraiwa (2012) and Grosu and Hoshi (2016) briefly suggest. It also matches with the notion of property change of an internal head within a relative clause as Tonosaki (1998) claims. However, almost no comprehensive research on the nature of the verbs occurred in CRs has been conducted from the lexical semantic point of view. We hypothesize that it will bring light to the mechanism of CRs if we apply the ideas of lexical semantic theories to give lexical semantic representations to the meanings of COS verbs.

Consequently, the process of clarifying the mechanism of CRs leads to an answer to the fundamental questions as described below.

(220) a. What is a CR?

b. What is the category of the post-relative *no* in a CR as well as the one in an HIRC?

We conclude that interpretation of a CR is involved more with lexical meanings of verbs than an HIRC. The semantic nature of COS verbs indicates that the predicate BECOME is the key factor for treating a relative clause ended with the particle *no* as a CR. When a verb with BECOME occurs in a CR, the post-relative *no* functions as a pronominal whereas the one in an HIRC does not.

We further clarify what the post-relative *no* refers to in a CR construction. It is the second element, i.e. the resultant of the predicate BECOME that the post-relative *no* refers to whereas the *no* of an HIRC does not. The resultant of BECOME contributes to the interpretation of a CR. On the other hand, the inner argument of a verb occurred in an HIRC will be required to be a theme in any semantic predicate functions and to be realized as the direct object syntactically. In this way, such a direct object can be a thetic focus. In other words, the syntactic contribution is a necessary condition for interpreting an HIRC.

6.2 Lexical Semantic Approach to Change Relatives

6.2.1 Semantic Nature of Change of State Verbs

Based on the assumption that COS verbs involve in a CR construction in the previous chapter, we focus on lexical meanings of COS verbs in Chapter 4. COS verbs are often studied along with the other well-known linguistic phenomena so-called "argument alternations" in order to find how arguments of verbs are realized on the surface. Many approaches are proposed syntactically as well as semantically. Chapter 4 shows some of the semantic approaches are useful tools to give lexical semantic representations to COS verbs in Japanese because those approaches are based on aspectual meanings of the verbs. One of the approaches is a verb root, which we combine with our semantic representation system to denote a result state for a certain type of COS verb. The other approach is the notion of telicity. As Rappaport Hovav and Levin (2010) and others claim, we assume that the telicity is compositionally determined.

In this dissertation, we treat COS verbs in a broader sense. As one of the COS verbs, a verb of transformation sense such as *samasu*, 'cool' encodes the semantic predicate BECOME to denote an inchoative state and contains information about the result state obtained through the root of verb like $\sqrt{SAM}$. This type of verb can have both telic and atelic readings depended on a type of temporal adverbial phrase such as a nondurative *in*-phrase and a durative *for*-phrase. From the predicate decomposition approaches, the verb *samasu* has both ACT and BECOME. Based on the two kinds

of readings, it is reasonable to postualte that the verb encodes BECOME truth-conditionally.

The other types of COS verb is verbs of consumption like *nomu*, 'drink' and verbs of creation like *tateru*, 'build' or verbs of incremental themes such as *kaku*, 'write.' A *nomu*-type of consumption verb has durative aspect whether or not its direct object is realized. However, this type of verb also has a telic reading when it takes a quantified NP like *three glasses of wine*. When the verb is used with a nondurative *in*-phrase, it cannot cancel the act of drinking, either, which is the consumption of a drink. The *nomu*-type verbs contain BECOME non-truth conditionally as well as truth conditionally. On the other hand, the verbs *tateru* and *kaku* have dominantly telic readings. They contain BECOME truth conditionally. These creation sense verbs cannot be compatible with a durative *for*-phrase at all.

In addition to these COS verbs, there is another type of COS verb that can shift its meanings between a sense of transformation and creation such as *horu*, 'carve' and *wakasu*, 'boil.' Like the verb *nomu*, this type of verb also has two readings: telic and atelic. Unlike other types of COS verbs such as *samasu* or *tateru*, a *horu*-type verb shows the difference in telic and atelic readings depended on the type of a NP as a direct object. It has a telic reading when it combines with a NP denoting some product while it has an atelic reading with a NP denoting some kind of material. This type of verb has two kinds of lexical semantic representations based on the compositionality of telicity, which is similar to the verb *nomu*. The *horu*-type verb with a sense of transformation contains BECOME non-truth conditionally as in (221) whereas the one with a sense of creation contains it truth conditionally as in (222).

(221)
$$\begin{bmatrix} horu_t \text{ (with transformation sense)} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } y \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{TS} = \left[\text{CONST: ACT-ON } (x, y)\right] \\ \text{NTS} = \left[\text{TELIC: } \exists z \text{ BECOME (BE-AT } (y, z)\right] \end{bmatrix} \end{bmatrix}$$

(222)
$$\begin{bmatrix} horu_c \text{ (with creation sense)} \\ \text{ARG} = \begin{bmatrix} \text{ARG1: } x \\ \text{ARG2: } z \text{ (physical object)} \\ \text{D-ARG1: } y \end{bmatrix} \\ \text{QUALIA} = \left[\text{TS} = \left[\text{CONST: CAUSE (ACT-ON } (x, y), \text{ BECOME (BE-AT } (y, z))\right)\right] \end{bmatrix}$$

Some other verbs, so-called manner verbs like *nuu*, 'sew,' which Levin and Rappaport Hovav

(2005) claim as such, can also have a telic and an atelic readings depended on the type of a NP as a direct object. Like the *horu*-type verb, this verb also is represented in two ways. The verb *nuu* with a transformation sense denotes BECOME non-truth conditionally whereas the one with a creation sense denotes it truth conditionally.

Our study on COS verbs indicates that some COS verbs contain the predicate BECOME either truth conditionally or non-truth conditionally. This way of representing the meaning of a verb explains the flexible compositionality of some COS verbs that participate in the argument alternations more clearly than Levin and Rappaport Hovav suggest. Our representation system also shows that some so-called manner verbs like *nuu* contain the predicate BECOME either non-truth conditionally or truth conditionally, which is similar observation as Beavers and Koontz-Garboden (2012) argue that some manner verbs contain result states.

6.2.2 Mechanism of Two Relative Clauses

With lexical semantic representations of COS verbs from the previous chapter, we clarify the semantic nature of "property change" of an internal head of the relative clause in a CR in the sense of Tonosaki (1996) in Chapter 5.

The typical verbs that are often appeared in CRs are the verb *naru* in a sentence *otamajakushi-ga kaeru-ni nat-ta no*, 'a frog that is the result of changing from a tadpole' and *tokasu*, 'melt' in a sentence *bataa-o tokashi-ta no*, 'thing which is result of melting butter.' Both verbs contain the predicate BECOME in their lexical meanings truth conditionally. The verb *naru* is an intransitive verb with an internally caused factor meanwhile the verb *tokasu* is a transitive verb with an externally caused factor. The verb phrases with these verbs are represented as in (223) and (224), respectively. These semantic representations indicate that both verbs specify the result state truth conditionally. The post-relative *no* refers to the resultant of BECOME at this semantic level.

(223)
$$\left[\begin{array}{l} \textit{otamajakushi-ga kaeru-ni naru} \text{ (the tadpole becomes a frog)} \\ \text{QUALIA} = \left[\text{TS} = \left[\text{CONST: BECOME (BE (}[\![\text{tadpole}]\!], [\![\text{frog}]\!]\text{))}\right]\right] \end{array}\right]$$

(224)
$$\left[\begin{array}{l} \textit{bataa-o tokasu} \text{ ((I) melt the butter)} \\ \text{QUALIA} = \left[\text{TS} = \left[\text{CONST: CAUSE (ACT-ON (}x, [\![\text{butter}]\!]\text{), BECOME (BE-AT (}[\![\text{butter}]\!], \sqrt{TOK}\text{))}\right]\right] \end{array}\right]$$

On the other hand, verbs usually appeared in HIRCs are those which denote existence such as *aru*, 'be' in a sentence like *ringo-ga sara-no ue-ni aru*, 'an applie is on a plate,' and some sense of motion or location such as *mottekuru*, 'bring' as in a phrase like *ringo-o mottekuru*, '(to) bring an apple.' The verb *aru* contains the predicate STATE which represents as [BE-AT (x, y)] and it has no BECOME. The verb *mottekuru* will have BECOME truth conditionally to denote a sense of change

of location so that it represents as [CAUSE (ACT-ON (*x*, *y*), BECOME (BE-AT (*y*, *z*)))]. When the predicate BECOME is focused on for the interpretation, which means the resultant of BECOME is prioritized, the relative clause involving the verb *mottekuru* can be treated as a CR. In fact, some native speakers consider the following sentence as a CR. This sentence is usually regarded as an HIRC since the direct object of a verb in the relative clause is more prioritized as a thetic focus to denote the existence of an apple which was brought in the presence of Ken.

(225) HIRC

Ken-ga [ringo-o motteki-ta {no / ??yatsu}]-o toridashi-te tabe-ta.
Ken-NOM apple-ACC bring-PAST {No / one}-ACC pick.out-COP eat-PAST

'Ken picked out the apples that he had brought and ate them.'
ケンがリンゴを持って来た { の / ??やつ } を取り出して食べた。

As Nishigauchi (2004) argues, the direct object of a verb is a typical position to allow a thetic predication form which affirms the existence of an entity or event that the verb phrase represents. Some other verbs related with thetic judgment are also candidates for constructing an HIRC when they are used in the relative clauses. The verb *kaku* is such a verb that represents the existence of the entity by the action denoted by the verb. Its semantic representation is similar to the verb *tokasu*. It has two subevents of a causing event and a result event, which is connected with CAUSE. The complex event of the verb *kaku* is specified truth conditionally. Either of the verbs *mottekuru* or *kaku*, takes a direct object on the surface. An HIRC construction does not concern whether the verb in the relative clause contains the resultant of BECOME. It concerns whether the theme argument of a verb is specified truth conditionally and is realized as a direct object syntactically.

In contrast, a CR construction concerns the resultant of BECOME as long as a verb in a CR contains the predicate BECOME. Besides the verbs *naru* and *tokasu*, there are other similar types of verbs like *kakinaosu*, 'rewrite' and *horu*, 'carve.' The verb *kakinaosu* is a variant of the verb *kaku* and it has a transformation sense. This verb has a similar semantic representation as the verb *samasu*, both of which have a resultant truth conditionally.

The verb *horu* has two meanings in accordance with the type of a NP: a sense of creation and transformation. When the verb *horu* with a transformation sense occurs in a relative clause ended with the particle *no*, the relative clause is treated as a CR. When the same verb with a creation sense occurs in a relative clause, the relative clause is treated as an HIRC.

In the case of the verb *horu* with a transformation sense, the post-relative *no* in the following example refers to the resultant of BECOME in NTS.

(226) CR

a. Ken-wa [[ki-o hot-ta] {no/mono}]-o kannso-sase-ta.
Ken-TOP wood-ACC carve-PAST no/thing-ACC dry-make-PAST
'Ken dried the thing that he carved.'
ケンは木を彫った { の/もの } を乾燥させた。

b. $\left[\begin{array}{l} \textit{Ken-wa ki-o horu}_t \text{ (Ken carves the wood)} \\ \text{QUALIA} = \left[\begin{array}{l} \text{TS} = \left[\text{CONST: ACT-ON } (\llbracket\text{Ken}\rrbracket, \llbracket\text{ki}\rrbracket)\right] \\ \text{NTS} = \left[\text{TELIC: } \exists z \text{ BECOME } (\text{BE-AT } (\llbracket\text{ki}\rrbracket, z))\right] \end{array}\right] \end{array}\right]$

Considering the example in the above, the post-relative *no* of a CR refers to the resultant of BECOME at NTS. Under the CR construction, the post-relative *no* can refer to the resultant even though it is not specified truth conditionally. When the resultant of BECOME is realized as *Ni*-phrase in the sentence like *otamajakushi-ga kaeru-ni nat-ta no*, the post-relative *no* refers to the resultant. Even though the resultant is not realized on the surface in the sentence like *bataa-o tokashi-ta no*, it is still encoded truth conditionally in its lexicon. The post-relative *no* can also refer to it. These observations clarify that the post-relative *no* refers to the resultant of BECOME whether the predicate BECOME is encoded truth conditionally or non-truth conditionally under a CR construction.

On the other hand, the verb *horu* with a creation sense, the NP 'a statue of Buddha' is the resultant of BECOME and is realized as a direct object syntactically. In this case, BECOME represents a sense of creation by the acting of carving. Consequently, the direct object is selected as an internal head of an HIRC.

(227) a. HIRC

Ken-wa [butsuzoo-o hot-ta {no / *mono}]-o kannso-sase-ta.
Ken-TOP Buddha.statue-ACC carve-PAST {No / thing}-ACC dry-make-PAST
'Ken carved the statue of Buddha and dried it.'
ケンは仏像を彫った { の / *もの } を乾燥させた。

b. $\left[\begin{array}{l} \textit{Ken-wa butsuzoo-o horu} \text{ (Ken carves the statue of Buddha)} \\ \text{ARG} = \left[\text{D-ARG: } y\right] \\ \text{QUALIA} = \left[\text{TS} = \left[\text{CONST: CAUSE } ([\text{ACT-ON } (\llbracket\text{Ken}\rrbracket, y)], [\text{BECOME } [\text{BE-AT } (y, \llbracket\text{butsuzoo}\rrbracket)])\right]\right] \end{array}\right]$

Finally, we have some evidences that the status of the post-relative *no* in a CR is a pronominal. This *no* is not the same as the one in an HIRC. If the post-relative *no* in the following sentence is

interpreted as a pronominal, the sentence cannot be regarded as a CR. However, it will improves the acceptability if it is treated as an HIRC. It is possible to say that the direct object 'rice' is foregrounded with the help of the verb *kau*, 'buy.' In this way the direct object gets a thetic focus, which is one of the conditions for HIRC constructions.

(228) HIRC

?[Ikari suupaa-de kat-ta kome-o paeria-ni tai-ta
Ikari supermarket-locative buy-PAST uncooked.rice-ACC paella-Ni cook-PAST
{no / *mono}]-no meigara-wa koshihikari-dat-ta.
{No / thing}-GEN brand-TOP koshihikari-be-PAST

'I cooked an rice which I bought at the Ikari supermarket and made paella from it, whose brand was *koshihikari*.'

?イカリスーパーで買った米をパエリアに炊いた{の / *もの}の銘柄はコシヒカリだった。

Furthermore, the following sentence further supports that the post-relative *no* in a CR is a pronominal whereas the one in an HIRC is not. The post-relative *no* in the second sentence is regarded as a pronominal, not as a complementizer. This *no* can refer to "rice" in the first sentence, which establishes an anaphoric relation as the one occurs in a CR.

(229) Asoko-no 3-tsu-no meigara-no(-kome-no)-uchi, [paeria-ni tai-ta]-no]-no
over.there-GEN 3-GEN brand-GEN(-rice-GEN)-among paella-Ni cook-PAST-no-GEN
meigara-wa koshihikari dat-ta.
brand-TOP koshihikari-be-PAST

'Among the 3 brands of rice over there, I made a paella from one of them, whose brand was *koshihikari*.'

あそこの3つの銘柄の（米の）うち、パエリアに炊いたのの銘柄はコシヒカリだった。

We believe that the clarification of the mechanism of CRs can be a great step toward further investigation on the nature of HIRCs both from syntactic and semantic points of view. Some constructions which are not easily considered to be an HIRC can be screened out by utilizing the findings about CRs we have presented here.

6.3 Concluding Remarks and Further Research

The purpose of this dissertation is to present a theoretical explanation to the mechanism of CRs. We believe we can give a thorough explanation based on the lexical semantic theories and can clarify the difference between CRs and HIRCs. However, we are not able to pay close attention to the mechanism of HIRCs besides relying on the assumption based on the previous studies. As we have presented in (228), some linguistic elements improve the acceptability of a sentence as an

HIRC. One of the possibilities is a syntactic contribution to the interpretation of an HIRC. Another embedded relative clause which includes the verb like *kau* may induce a thetic focus on the direct object within an relative clause, which leads to behave as an HIRC.

The other possibility may be a sentence processing or any other factors involved in the language processing. As shown in the following example of (230), which is first presented in Chapter 5, the acceptability of the relative clause ended with the particle *no* can be improved by inserting some expression between the direct object and the post-relative *no*.

(230) [Kome-o tai-te oishiku tabe-ta {no / *mono}]-no meigara-wa
uncooked.rice-ACC cook-COP enjoy eat-PAST {No / thing}-GEN brand-TOP
koshihikari-dat-ta.
koshihikari-be-PAST
'I cooked an rice and enjoyed eating it, whose brand was *koshihikari*.'
米を炊いておいしく食べた{ の / *もの } の銘柄はコシヒカリだった。

From the problems that we face in the current research, it may be useful to put weight on the following points to give a further detailed theoretical explanation for mechanism of HIRCs in the future research.

(231) a. A syntactic contribution to the interpretation of an HIRC
b. A sentence processing factor to the interpretation of an HIRC

Considering that the pragmatic points are assumed to be involved in the treatment of an HIRC, some approaches from the sentence processing point of view may be helpful. Along with the processing point of view, syntactic relations with HIRCs should be more closely paid attention to. A certain type of linguistic features related with syntactic structures will be involved in the interpretation of HIRCs.

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