On Interpretation of Resultative Phrases in Japanese

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Abstract

The present paper attempts to formalize the semantic interpretation of resultative phrases in Japanese in the framework of Generative Lexicon, with a focus on the semantic subject of resultative phrases, i.e. the entity which resultative phrases are predicated of. The semantic subject cannot always be identified with the direct object of transitive verbs or the subject of unaccusative verbs, as generally believed, but also is expressed as an oblique NP or not syntactically expressed at all. It poses a challenge to the interpretation of resultative phrases since it cannot be tied to a specific syntactic constituent. The interpretation of resultative phrases is encoded in terms of the FORMAL quale and its argument built through the co-composition operation.

1 General Properties of Japanese Resultatives

The resultative phrase is most generally characterized as the second predicate to describe the state of an argument, which results from the event denoted by the main verb. It is generally understood (e.g. Tsujimura, 1990; Kageyama, 1996) that resultative phrases in Japanese come in two types: object-oriented resultative phrases with transitive verbs and subject-oriented resultative phrases with unaccusative intransitive verbs. Object-oriented resultative phrases appear in a sentence headed by a transitive verb, and describe the resultant state of the referent of object NP as in (1). (In the following examples, resultative phrases are underlined while the semantic subjects of resultative phrases are in bold.)

(1) Taro-ga **kabin**-o konagona-ni kowasi-ta.
Taro-NOM vase-ACC pieces-NI break-PAST
'Taro broke the vase into pieces.'

In (1), the resultative phrase *konagona-ni* 'into pieces' describes the state of the object *kabin* 'vase' which results from Taro's breaking it. Subject-oriented resultative phrases, on the other hand, appear with an unaccusative intransitive verb, and describe the state of the referent of subject NP, which results from the event expressed by the verb, as in (2).

(2) **hune**-ga huka-ku sizun-da.
ship-NOM deep-KU sink-PAST
'A ship sank deep.'

The resultative phrase *huka-ku* 'deep' describes the resultant state of the referent of subject *hune* 'ship' after its sinking.

These resultatives conform to the general characteristics of two of the three types of resultatives in English, originally observed and analyzed by Simpson (1983). The resultative construction in Japanese, however, lacks the third type in Simpson's analysis of English resultatives with an unergative intransitive verb with 'a fake object', in which the semantic subject of resultative phrases is not an argument subcategorized by the main verb: e.g. *I cried my eyes blind*. Other types of phrases which are analyzed as resultatives by various authors are also absent in Japanese: phrases that appear with the main verbs of sound emission (e.g. *The garage door rumbles open*.) and of location change (e.g. *John danced mazurkas*

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across the room.). The analysis in the present paper mostly focuses on the first type of typical resultative phrases in Japanese shown in (1), i.e. the construction with a transitive verb and an object-oriented resultative phrase.

As a direct consequence of the definition that resultative phrases express the state that results from the event denoted by the verb, the verbs which appear in the construction denote a change of state either lexically or by virtue of an accompanying resultative phrase (cf. Pustejovsky, 1991 for a distinction between the true resultatives and the emphatic resultatives). Although the verbs can lexically be either telic or atelic, the result expressed by a resultative phrase provides an end point to the event, making the whole sentences descriptions of a bounded event.

The state expressed by a resultative phrase is generally a result which is predictable, or 'canonical or generic' (Wechsler, 1997), from the event denoted by the main verb. Some authors analyze resultative phrases as a syntactic realization of the description of a result which is lexically encoded in the semantic representation of the verb to start with (e.g. Green, 1972). Washio (1997) claims that resultatives in Japanese describe only a predictable result, called 'weak resultatives', while English additionally allows 'strong resultatives': for example, the sentence *The horses dragged the logs smooth* has no well-formed Japanese equivalent because, it is claimed, logs' being smooth is not a result predictable from horses' dragging them. Wechsler (1997) points out that the third type in Simpson's (1980) analysis, i.e. resultatives with an unergative intransitive verb and a non-subcategorized object, do not require the expressed result to be predictable in English, and the lack of resultatives of this type in Japanese gives an empirical justification to Washio's claim that Japanese allows only resultative phrases of a predictable result.

At the same time, in either in English or Japanese, it seems undeniable that even resultative phrases expressing a predictable result are not totally productive. That is, collocations of particular verbs and resultative phrases are to some extent conventionalized, or idiomatic, and expressions of imaginable results are not always acceptable: for example, **hutatu-ni kowasi-ta* 'broke into two pieces' is not acceptable while *konagona-ni kowasi-ta* 'broke into pieces' in (1) and *mapputatu-ni kowasi-ta* 'broke into exact halves' are.

Morphologically, the head of resultative phrases can be a noun such as *konagona-* 'pieces' in (1), an adjective such as *huka-* 'deep' in (2), or an adjectival noun such as *taira-* 'flat' in (18). Nouns and adjectival nouns are suffixed by *-ni*, and adjectives are suffixed by *-ku* in resultative phrases. These morphological forms are, however, not unique to the resultative construction, and they also mark the head of coordinate and subordinate clauses, and adverbial uses of nouns and adjectives.

As a general characteristic of sentence structures, Japanese imposes few restrictions on the ordering among coarguments and adjuncts within a clause, and allows variations in the linear order of phrases including resultative phrases. While the linear order of the nominative NP, the accusative NP, and the resultative phrase in Japanese examples (1) and (2) is the unmarked one, the other linear orders are also possible as long as the verb remains at the end of the sentence.

2 Analysis of Resultatives Cast in Generative Lexicon

The object oriented resultative in (1) can be analyzed straightforwardly in the framework of Generative Lexicon, following the analysis for English resultatives in Pustejovsky (1995). The semantic representation of the verb *kowas-* 'break' in (1) is shown in (3).

(3) the semantic representation of *kowas-*'break' in (1)

$$\begin{bmatrix} \textit{kowas-}\text{ 'break'} \\ \text{EVENTSTR} = \begin{bmatrix} E_1 = e_1\text{:process} \\ E_2 = e_2\text{:state} \\ \text{RESTR} = <_\infty \\ \text{HEAD} = e_1 \end{bmatrix} \\ \text{ARGSTR} = \begin{bmatrix} \text{ARG}_1 = [1] \begin{bmatrix} \text{animate-ind} \\ \text{FORMAL} = \text{physobj} \end{bmatrix} \\ \text{ARG}_2 = [2] \begin{bmatrix} \text{artifact} \\ \text{FORMAL} = \text{physobj} \end{bmatrix} \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{default-causative-lcp} \\ \text{AGENTIVE} = \text{break-act}(e_1, [1], [2]) \\ \text{FORMAL} = \text{break-result}(e_2, [2]) \end{bmatrix} \end{bmatrix}$$

The representation in (3) states that *kowas-*'break' is a transitive verb of direct causation. It takes two arguments: the first argument ARG_1 is an animate being which corresponds to the syntactic subject *Taro-ga* 'Taro-NOM' in (1) while the second argument ARG_2 is an artifact which is realized as the object NP *kabin-o* 'vase-ACC'.

The FORMAL quale in (3) indicates that the verb *kowas-* 'brake' denotes a change of state, and that it is the referent of the object NP, marked as [2], that undergoes the change. As discussed in Section 1, Japanese allows only resultative phrases of a predictable result, and a range of predictable results is lexically encoded as break-result in (3). Following the processing model proposed by Nakatani (2007), it is assumed that the semantic representation of resultative phrase *konagona-ni* 'into pieces' is conjoined into the FORMAL quale through the co-composition operation, further specifying the resultant state of the vase.

The following sections demonstrate that, unlike the typical example of object-oriented resultatives in (1), it is not always the referent of object NP that undergoes a change of state and appears in the FORMAL quale of the verb.

3 Polysemous Arguments with Resultative Phrases

It is commonly assumed that a resultative phrase can be paraphrased as a clause which describes a result: for example, the sentence *Taro broke the vase into pieces* in (1) can be paraphrased as 'Taro broke the vase, and (as a result) the vase was in pieces.' The paraphrasing captures the interpretation of the resultative phrase as a description of the state of the vase which results from the breaking event.

Some instances of the resultative construction such as (4), however, resist paraphrasing, posing a problem to the generalization that the resultative phrase with a transitive verb is object-oriented.

(4) Taro-ga mado-o ooki-ku ake-ta.
Taro-NOM window-ACC big-KU open-PAST
'lit. Taro opened the window big.'

The resultative phrase *ooki-ku* 'big' in (4) describes the window being wide-open as a result of Taro's opening it. The putative paraphrase *mado-ga ooki-i* 'The window is big', however, can only be interpreted as a description of the size of the window as a physical object, and not of the opening. Clearly, paraphrasing as a simple diagnostic tool of a resultative phrase fails due to the polysemous behavior of the noun *mado* 'window'.

As is the case of the English counterpart *window*, *mado* can refer to both a physical object and an aperture, which is often called figure/ ground polysemy. The multiple senses are represented in terms of a dot object physobj·aperture in the QUALIA structure in the semantic representation of *mado* 'window' in (5).

(5) the semantic representation of *mado* 'window' in (4)

$$\left[\begin{array}{l} \textit{mado}\text{ 'window'} \\ \text{ARGSTR} = \left[\begin{array}{l} \text{ARG}_1 = [1]\text{physobj} \\ \text{ARG}_2 = [2]\text{aperture} \end{array}\right] \\ \text{QUALIA} = \left[\begin{array}{l} \text{physobj·aperture-lcp} \\ \text{FORMAL} = \text{aperture-of}([2], [1]) \end{array}\right] \end{array}\right]$$

When *mado* 'window' appears as the object NP of the causative verb *ake-* 'open' as in (4), co-composition of their semantic representations gives rise to the semantic representation shown in (6).

(6) the semantic representation of *mado-o ake-* 'open a window' in (4)

$$\left[\begin{array}{l} \textit{mado-o ake-}\text{ 'open a window'} \\ \text{EVENTSTR} = \left[\begin{array}{l} \text{E}_1 = \text{e}_1\text{:process} \\ \text{E}_2 = \text{e}_2\text{:state} \\ \text{RESTR} = <_\infty \\ \text{HEAD} = \text{e}_1 \end{array}\right] \\ \text{ARGSTR} = \left[\begin{array}{l} \text{ARG}_1 = [3]\text{animate-ind} \\ \text{ARG}_2 = [4]\left[\begin{array}{l} \text{window} \\ \text{FORMAL} = \text{aperture-of}([2], [1]) \end{array}\right] \end{array}\right] \\ \text{QUALIA} = \left[\begin{array}{l} \text{default-causative-lcp} \\ \text{AGENTIVE} = \text{open-act}(\text{e}_1, [3], [4]) \\ \text{FORMAL} = \text{open-result}(\text{e}_2, [2]) \end{array}\right] \end{array}\right]$$

The VP *mado-o ake-* denotes an event of opening a window. The verb is a two-place predicate and takes an animate individual as the first argument ARG_1, which is syntactically realized as the subject NP, and the object NP *mado-o* 'window-ACC' as the second argument ARG_2. The FORMAL quale selects a dot element aperture, marked as [2] in both (5) and

(6), from the multiple referents of object NP. This dot element is available for modification by the resultative phrase.

Following Pustejovsky (1995), in (5), both a physical object sense and an aperture sense are analyzed to be the denotation of a single lexical item *mado* 'window', i.e. members of physobj·aperture-lcp, rather than denotations of separate homonymous nouns. Consequently, the selection of the object *mado* 'window' as the semantic subject of resultative phrase in (4) still conforms to the generalization that resultative phrases with a transitive verb are object-oriented. However, paraphrasing of the resultative phrase as a clause *mado-ga ooki-i* 'The window is big' fails because the predicative adjective *ooki-i* 'big' induces the interpretation of the subject *mado* 'window' as a physical object rather than an aperture. Although the exact aspects of linguistic environments which determine the 'sense in context' of polysemous nouns is not clear, it is clear that the explicit semantic representation of polysemous nouns as dot objects, such as in (5), is necessary to represent the exact sense of the semantic subject of resultative phrases.

4 Locative-Alternation Verbs with Resultative Phrases

The resultative construction in English is subject to the constraint, originally observed and analyzed by Simpson (1983), later dubbed Direct Object Restriction (the DOR; Levin and Rappaport Hovav, 1995), that the semantic subject of resultative phrases must be the direct object of the transitive verb, or the underlying object (surface subject) of the unaccusative intransitive verb. Accordingly, the contrast of examples such as those in (7) has repeatedly been pointed out.

(7) (Williams, 1980:204)
a. John loaded **the wagon** full with hay.
b. *John loaded the hay into **the wagon** full.

The resultative phrase *full* in both examples in (7) is intended to describe the state of the goal argument *the wagon*. Only (7a), however, is acceptable where the semantic subject *the wagon* of the resultative phrase is expressed as the syntactic object of the verb, as predicted by the DOR. Since the two examples in (7) are near paraphrases of each other, the nature of the DOR is clearly syntactic, rather than semantic, and it is often rephrased in terms of the syntactic structure of sentence constituents and the *c*-command relation in them (e.g. Levin and Rappaport Hovav, 1995).

Although the same constraint is generally assumed for Japanese resultatives (e.g. Takezawa, 1993; Koizumi, 1994), the examples in (8) show that the resultative phrase *aka-ku* 'red' can be predicated of not only the object NP *kabin-o* 'vase-ACC' in (8a), but also the oblique NP *kabin-ni* 'vase-LOC' in (8b) in Japanese.

(8) a. Taro-ga **kabin**-o penki-de
Taro-NOM vase-ACC paint-INSTRUMENTAL
aka-ku nut-ta.
red-KU cover/apply-PAST
'lit. Taro covered the vase with paint red.
(Taro painted the vase red.)'

b. Taro-ga **kabin**-ni penki-o
Taro-NOM vase-LOC paint-ACC
aka-ku nut-ta.
red-KU cover/apply-PAST
'lit. Taro applied paint to the vase red.
(Taro painted the vase red.)'

The argument structure of the verb *nut-* 'cover/apply' alternates in a similar way to that of the English verbs *load*, *splash* and *spray*, a phenomenon called 'locative alternation' (Levin and Rappaport Hovav, 1995): the goal argument *kabin* 'vase', i.e. the object NP in (8a), can also be expressed as an oblique NP as in (8b), in which case, the theme argument *penki* 'paint' is expressed as the object NP. The adjective *aka-*'red' describes the resultant state of the vase (the paint is red to start with) after Taro's painting it regardless of whether the vase is expressed as an object or an oblique NP.

In the semantic representation of the verb *nur-* 'cover/apply' in (9), the AGENTIVE quale is assumed to be a three-place predicate, which takes the agent, the theme, and the goal arguments.

(9) the semantic representation of *nur*-'cover/ apply' in (8)

$$\begin{bmatrix} \text{nur- 'cover/apply'} \\ \text{EVENTSTR} = \begin{bmatrix} E_1 = e_1\text{:process} \\ E_2 = e_2\text{:state} \\ \text{RESTR} = <_\infty \\ \text{HEAD} = e_1 \end{bmatrix} \\ \text{ARGSTR} = \begin{bmatrix} ARG_1 = [1]\text{animate-ind} \\ ARG_2 = [2]\text{material} \\ ARG_3 = [3]\text{physobj} \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{default-causative-lcp} \\ \text{AGENTIVE} = \text{put-act}(e_1, [1], [2], [3]) \\ \text{FORMAL} = \text{on}(e_2, [2], [3]) \end{bmatrix} \end{bmatrix}$$

When the goal argument ARG$_3$, *kabin* 'vase', is mapped to the object NP as in (8a), it is the semantic subject of the resultative phrase as it would be in *spray the vase red with paint* in English. When the theme argument ARG$_2$, *penki* 'paint', is mapped to the object NP as in (8b), the resultative phrase can still be predicated of the goal argument *kabin* 'vase', although English equivalent, **spray paint on the vase red*, would be unacceptable. The equal acceptability of both examples in Japanese indicate that resultative phrases in Japanese are manifestations of the FORMAL quale of the semantic representation, not constrained by its syntactic realization as is the case of English resultatives.

5 Creation Verbs with Resultative Phrases

While resultative phrases can describe the referent of an oblique NP as shown in the previous section, they can also be predicated of an entity only implied in the sentence. The examples in (10) show alternating uses of the verb *hor*- 'dig'.

(10)a. Taro-ga zimen-o huka-ku hot-ta.
Taro-NOM ground-ACC deep-KU dig-PAST
'lit. Taro dug the ground deep. (Taro dug a deep hole in the ground.)'

b. Taro-ga **ana**-o huka-ku hot-ta.
Taro-NOM hole-ACC deep-KU dig-PAST
'lit. Taro dug a hole deep. (Taro dug a deep hole.)'

In (10a), the verb *hor*- 'dig' takes the agent *Taro* 'Taro' as its subject and the theme *zimen* 'ground' as its object. Assuming the verb is lexically a simple transitive verb of state change (Pustejovsky 1991: 123), the basic semantic structure of the verb is represented as in (11).

(11)the basic semantic representation of *hor*- 'dig'

$$\begin{bmatrix} \textit{hor-} \text{ 'dig'} \\ \text{EVENTSTR} = \begin{bmatrix} E_1 = e_1\text{:process} \\ \text{HEAD} = e_1 \end{bmatrix} \\ \text{ARGSTR} = \begin{bmatrix} ARG_1 = [1]\text{animate-ind} \\ ARG_2 = [2]\text{physobj} \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{state-change-lcp} \\ \text{AGENTIVE} = \text{dig-act}(e_1, [1], [2]) \end{bmatrix} \end{bmatrix}$$

The verb denotes an event of digging. It is a two-place predicate and takes an animate individual as the first argument ARG$_1$, which carries the agent role, and some physical object as the second argument ARG$_2$, which carries the theme role.

The instance of the verb *hor*- 'dig' in (10b), on the other hand, is a derived use of the verb as a creation verb: that is, the object *ana* 'hole' expresses the product of digging. The co-composition operation between the verb of state change in (11) and the object NP expressing the product of the process gives rise to the derived semantic representation of indirect causation for the phrase *ana-o hot-ta* 'dug a hole' in (12) for (10b).

(12)the semantic representation of *ana-o hor*-'dig a hole' in (10b)

$$\begin{bmatrix} \textit{ana-o hor-} \text{ 'dig a hole'} \\ \text{EVENTSTR} = \begin{bmatrix} E_1 = e_1\text{:process} \\ E_2 = e_2\text{:state} \\ \text{RESTR} = <_\infty \\ \text{HEAD} = e_1 \end{bmatrix} \\ \text{ARGSTR} = \begin{bmatrix} ARG_1 = [1]\text{animate-ind} \\ D\text{-}ARG_1 = [2]\text{physobj} \\ ARG_2 = [3]\begin{bmatrix} \text{hole} \\ \text{CONST} = \text{part-of}([2]) \end{bmatrix} \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{create-lcp} \\ \text{AGENTIVE} = \text{dig-act}(e_1, [1], [2]) \\ \text{FORMAL} = \text{dig-result}(e_2, [3]) \end{bmatrix} \end{bmatrix}$$

The second argument ARG$_2$ in (11), which is realized as *zimen* 'ground' in (10a), is now demoted to a default argument D-ARG$_1$ in (12), and no longer syntactically expressed in the sentence (10b). Instead, the third argument ARG$_2$ which corresponds to the product of digging is realized as the object NP *ana-o* 'hole-ACC' of the verb. It is also composed into the FORMAL quale, and modified by the resultative phrase *huka-ku* 'deep' in (10b).

The resultative phrase in (10b) is a typical instance of the object-oriented resultative construction: it describes the state of the direct object *ana-o* 'hole-ACC' which results from digging. The resultative phrase in (10a), on the other hand, lacks an expression of the semantic subject although it is still understood to describe a hole which is created by the digging event.

As shown in the basic semantic representation in (11), the verb *hor-* 'dig' is a process verb which denotes a change of state of the theme argument, i.e. *zimen* 'ground' in (10a). Aspectually, the lexical verb is atelic and the digging event denoted by *zimen-o hor-* 'dig the ground' (without a resultative phrase) does not entail any final product coming into being, which would serve as a bound of the digging event. Both the examples with resultative phrases in (10), however, express an event which is bounded by the creation of a deep hole. While it is the expression of the product, *ana* 'hole', as the object NP that brings about the derived creation sense of the verb in (10b), the example in (10a) demonstrates that obviously, the resultative phrase *huka-ku* 'deep' is sufficient to derive the creation sense of the verb and implies the product of digging as the (unexpressed) semantic subject. That is, the semantic contribution of the resultative phrase in (10a) brings about a FORMAL quale similar to that in (12), a predicate of a hole. Co-composition of the verb *hor-* 'dig' of state change in (11) and the resultative phrase derives a semantic representation similar to (12) for indirect causation, as shown in (13).

(13) the semantic representation of *zimen-o hor-*'dig the ground' with the resultative phrase in (10a)

$$\left[\begin{array}{l} \textit{zimen-o hor-}\text{ 'dig the ground'} \\ \text{EVENTSTR} = \left[\begin{array}{l} E_1 = e_1\text{:process} \\ E_2 = e_2\text{:state} \\ \text{RESTR} = <_\infty \\ \text{HEAD} = e_1 \end{array}\right] \\ \text{ARGSTR} = \left[\begin{array}{l} \text{ARG}_1 = [1]\text{animate-ind} \\ \text{ARG}_2 = [2]\text{ground} \\ \text{D-ARG}_1 = [3]\left[\begin{array}{l} \text{hole} \\ \text{CONST} = \text{part-of}([2]) \end{array}\right] \end{array}\right] \\ \text{QUALIA} = \left[\begin{array}{l} \text{create-lcp} \\ \text{AGENTIVE} = \text{dig-act}(e_1, [1], [2]) \\ \text{FORMAL} = \text{dig-result}(e_2, [3]) \end{array}\right] \end{array}\right]$$

Unlike the derived creation verb in (12) for (10b), the second argument ARG$_2$ in (11) for *zimen* 'ground' remains as a true argument in (13) and is syntactically realized as the object NP. Like (12), however, the third argument for the product of digging is added as a default argument D-ARG$_1$ as part of the semantic contribution of the resultative phrase, and it also appears in the FORMAL quale.

6 The Shadow Argument with Resultative Phrases

Sentences like (14) and (15) have long posed a syntactic puzzle, in which resultative phrases describe a resultant state after the event expressed by the verb but concern an entity that could not constitute an argument of the verb. In (14), the resultative phrase *kata-ku* 'tight, stiff' describes the tightness of a knot of shoe laces, but not of shoe laces.

(14) (Washio, 1997:18)
kare-wa kutu-no himo-o
he-TOP shoe-GEN lace-ACC
kata-ku musun-da.
tight-KU tie-PAST
'He tied his shoelaces tight.'

Similarly in (15), the resultative phrase *atu-* 'thick' is naturally interpreted as describing a state of ice formed as a result of the river's freezing.

(15) (Korean equivalent is pointed out by Wechsler and Noh, 2001:409)
kawa-ga atu-ku koot-ta.
river-NOM thick-KU freeze-PAST
'lit. The river froze thick.'

Unlike previous examples in Sections 4 and 5, there is no straightforward way to incorporate the individuals predicated by the resultative phrases into the sentences using either an oblique NP or alternating argument structures of the verbs. Hence, Washio (1997) analyzes *kata-ku* 'tight' in (14) as an example of 'the spurious resultative' which describes the manner of action, rather than a resultant state of anything, and Wechsler and Noh (2001) claim that the Korean equivalent of *atu-ku* 'thick' in (15), *twukkep-key,* is not a resultative phrase but an adverbial use of the adjective which describes 'a thick manner' of the freezing event. (Note that as discussed in Section 1, the suffix *-ku* in Japanese, as well as *-key* in Korean, is attached to adjectives to mark either resultative phrases or adverbial uses of adjectives.) Aside from the fact that the sentences lack overt expressions of the semantic subject, however, there is no independent evidence to consider the examples in (14) and (15) as distinct constructions from the resultative.

Although the resultative construction in English requires the semantic subject to be expressed as the direct object of the transitive verb, there are some expressions of a result similar to (14) and (15), which Levinson (2010) calls 'resultative adverbs' following the analysis of Geuder (2000).

(16) (Levinson, 2010:137)
a. They decorated the room beautifully.
b. They loaded the cart heavily.

In these examples in (16), the suffix *-ly* of *beautifully* and *heavily* is obligatory, and hence morphologically they are clearly adverbs. However, they are distinct from typical manner adverbs in that *beautifully* does not describe the manner of their decorating the room in (16a), and it is not the manner of their loading action that is heavy in (16b). Rather, they describe an individual which undergoes a change of state as resultative phrases generally do, and through the description of the result, they describe a way the event is carried out.

While the individual that undergoes a change can be identified with the referent of the direct object *the room* in (16a), such an individual is not expressed in (16b). Nevertheless, the only possible interpretation of the sentence is that it is the load on the cart that undergoes a change of state and is described by the adverb *heavily*. Geuder (2000) proposes a function which selects such a pragmatically salient entity, not necessarily expressed in a sentence, among the participants of the event described by the main verb. In Generative Lexicon terms, the load is a necessary element of the loading event and, though not realized syntactically, constitutes a shadow argument incorporated into the lexical semantics of the verb *load* (cf. Levinson, 2010 for a semantic analysis of 'root creation verbs' such as *load*).

The examples of resultative phrases in (14) and (15) are similar to the resultative adverbs in English in (16) in that they describe an entity which is salient in the event but not expressed as an element of the sentence. A knot of shoe laces implicit in (14) and ice in (15) are incorporated into the semantics of the verbs *musub-* 'tie' and *koor-* 'freeze', and are available for modification by the adjective phrases *kata-ku* 'stiff' and *atu-ku* 'thick' respectively. While resultative adverbs in (16) are formally distinct from resultative phrases in English, in Japanese, there is no morphological evidence to consider those adjective phrases in (14) and (15) distinct from resultative phrases. They are instances of the resultative construction which pervasively exhibits a lack of syntactic expressions of the semantic subject.

The proposed semantic representation for the verb *koor-* 'freeze' in (15) is given in (17). The verb is lexically unaccusative and describes the event headed by the stative sub-event e_2. Unaccusative verbs often induce the interpretation of resultative phrases as a description of the syntactic subject as exemplified in (2). In (15), however, the resultative phrase *atu-ku* 'thick' is not predicated of the syntactic subject *kawa* 'river' of the verb but rather of the shadow argument S-ARG_1 which refers to the ice formed as a result of the freezing event.

(17) the semantic representation of *koor-* 'freeze' in (15)

$$\left[\begin{array}{l} \textit{koor-}\text{ 'freeze'} \\ \text{EVENTSTR} = \left[\begin{array}{l} E_1 = e_1\text{:process} \\ E_2 = e_2\text{:state} \\ \text{RESTR} = <_\infty \\ \text{HEAD} = e_2 \end{array}\right] \\ \text{ARGSTR} = \left[\begin{array}{l} \text{ARG}_1 = [1]\text{liquid} \\ \text{S-ARG}_1 = [2]\left[\begin{array}{l} \text{ice} \\ \text{CONST} = \text{solid-state-of}([1]) \end{array}\right] \end{array}\right] \\ \text{QUALIA} = \left[\begin{array}{l} \text{default-causative-lcp} \\ \text{AGENTIVE} = \text{freeze-act}(e_1, [1]) \\ \text{FORMAL} = \text{freeze-result}(e_2, [2]) \end{array}\right] \end{array}\right]$$

The semantic representation states that the freezing event necessarily brings about a frozen entity, which is a solid state of the argument ARG1. While the entity does not surface in a sentence, thus encoded as a shadow argument S-ARG1, it is still an argument of the FORMAL quale and available for modification by resultative phrases.

7 Problem: Destruction Verbs with Resultative Phrases

Unlike previous examples, some resultative phrases seem to be predicated of an entity which cannot be considered as a true argument, a default argument, or a shadow argument of the verb. The examples in (18) show resultative phrases with a transitive verb *kezur-* 'scrape'.

(18)

a.* hyoga-ga **zimen**-o taira-ni kezut-ta.
glacier-NOM ground-ACC flat-NI scrape-PAST
'lit. Glaciers scraped the ground flat.'

b. hyoga-ga **yama**-o taira-ni kezut-ta.
glacier-NOM mountain-ACC flat-NI scrape-PAST
'lit. Glaciers scraped mountains flat.'

The resultative phrase *taira-ni* 'flat' in (18a) is intended to describe the state of the referent of object *zimen* 'ground' after glaciers scraping it. The sentence is, however, unacceptable with the resultative phrase probably because the ground is generally perceived as a flat entity, and it is hard to interpret the adjective phrase as a description of the result of a change, or as an adverbial which describes the manner of scraping. On the other hand, replacing the object with *yama* 'mountain', makes the sentence acceptable as shown in (18b). In (18b), the resultative phrase *taira-ni* 'flat' describes the state resulting from glaciers' scraping mountains away. The natural interpretation, however, gives rise to a problem that the resultative phrase cannot be predicated of the object since mountains are not flat by definition of the word.

The verb *kezur-* 'scrape' is a simple causative verb as its basic use, and the direct object denotes the theme argument as in *zimen-o kezur-* 'scrape the ground' in (18a), *ki-o kezur-* 'plane wood', and *enpitu-o kezur-* 'sharpen a pencil'. In (18b) with the resultative phrase, on the other hand, the object NP refers to an entity which is destroyed as a result of the scraping event, and the use of the verb is, in a sense, an inverse of the verb *hor-* 'dig' as a creation verb discussed in Section 5: a creation verb takes an object which expresses an entity created by the event while a 'destruction verb' takes an object which expresses an entity eliminated by the event.

Assuming the instance of the verb *kezur-* 'scrape' in (18b) is a derived use of indirect causation, its semantic representation is approximated in (19), based upon the semantic representation of *hor-* 'dig' as a creation verb shown in (12).

(19) a tentative semantic representation of *yama-o kez-*'scrape mountains' in (18b)

$$\left[\begin{array}{l} \textit{yama-o kezur-}\text{ 'scrape mountains'} \\ \text{EVENTSTR} = \left[\begin{array}{l} E_1 = e_1\text{:process} \\ E_2 = e_2\text{:state} \\ \text{RESTR} = <_\infty \\ \text{HEAD} = e_1 \end{array}\right] \\ \text{ARGSTR} = \left[\begin{array}{l} \text{ARG}_1 = [1]\text{phyobj} \\ \text{D-ARG}_1 = [2]\text{physobj} \\ \text{ARG}_2 = [3]\left[\begin{array}{l} \text{mountain} \\ \text{CONST} = [2] \end{array}\right] \end{array}\right] \\ \text{QUALIA} = \left[\begin{array}{l} \text{destroy-lcp} \\ \text{AGENTIVE} = \text{scrape-act}(e_1, [1], [2]) \\ \text{FORMAL} = \neg\text{exist}(e_2, [3]) \end{array}\right] \end{array}\right]$$

The theme argument, which is realized as *zimen* 'ground' in (18a), is represented as a default argument D-ARG1 in (19), and syntactically not expressed in the sentence (18b). Instead, the object

yama 'mountain' is encoded as the second true argument ARG_2. This argument, marked as [3], corresponds to the entity eliminated as a result of the scraping event, and is also composed into the FORMAL quale, $\neg$ exist(e_2, [3]). Thus, the semantic representation implies that the object would be available for modification by a resultative phrase. The resultative phrase *taira-ni* 'flat' in (18b), however, cannot be analyzed as predicated of mountains, and conjoining the semantic representation of the resultative phrase would produce a logical representation of an entity which is non-existent yet flat.

The general problem in analyzing resultative phrases with verbs of destruction is that the resultative construction in Japanese allows a resultative phrase to cooccur with an object NP whose referent is an entity to be destroyed or eliminated in the event described by the verb. The resultative phrase denotes a property which can no longer be predicated of the destroyed entity. Rather, it describes an entity which is a remnant of destruction but does not constitute an argument of the verb. The problem of representation of the semantic subject of such resultative phrases is left open for further research.

8 Conclusion

It has been demonstrated that the resultative construction in Japanese describes the resultant state of a wide range of participants of the event. Unlike the counterpart in English, the semantic subject of resultative phrases in Japanese cannot always be identified with the referent of the direct object of transitive verbs, or the subject of unaccusative intransitive verbs. Rather, interpretation of resultative phrases requires an extensive semantic context which makes it possible to identify the individual described by resultative phrases, whether it is expressed as the syntactic object as shown in Section 2, as a 'sense in context' of polysemous nouns as in Section 3, as an oblique NP as in Section 4, or not expressed at all as in Sections 5 through 7.

The argument of resultative phrases is commonly referred to as the 'affected theme' of change-of-state events, an individual which undergoes a change of state in the event expressed by the verb (e.g. Miyagawa, 1989). It is shown that such individuals are not limited to those formally encoded in the argument structure of the verb as the theme argument, but also include the goal argument of locative-alternation verbs (e.g. *nur-* 'cover/apply'), the product of creation verbs (e.g. *hor-* 'dig'), and the implied outcome of lexical causative verbs (e.g. *musub-* 'tie') and unaccusative verbs (e.g. *koor-* 'freeze'). Since the resultative construction in Japanese does not require those individuals to be expressed as part of a sentence, standard compositional semantics based upon the syntactic constituents of the surface sentence is not enough to capture the full range of individuals available for modification by resultative phrases. The proposed analysis is an attempt to encode the notion of 'affected theme' into the semantic representation through co-composition of the semantic representations of a verb, its complements or default/shadow arguments, and a resultative phrase.

A further problem of resultative phrases with verbs of destruction is pointed out, but left open. It is not clear how to compose into the semantic representation an entity which results from destruction and is described by a resultative phrase, but does not constitute an argument of the verb.

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