VERB MEANING VS. CONSTRUCTION MEANING: 
THE CASES OF HIT, SPRAY, AND LOAD

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A Lexical Network Approach to Verbal Semantics, by Seizi Iwata, 

Keywords: argument alternation, a conceptual semantics approach, a 
construction-based approach, causal chain

1. Introduction

In recent years there has been a growing interest in verbal semantics 
among researchers in (Lexical) Conceptual Semantics as well as among 
those in Cognitive Linguistics. The book under review, Iwata (1998, 
hereafter SI) presents a lexical network approach to the area of verbal 
semantics in an attempt to develop a theory which integrates the in-
sights of Conceptual Semantics and those of Cognitive Linguistics. As 
a descriptive work, this book provides intriguing detailed analyses of an 
extensive range of English verbs, including verbs of touch by impact, 
extent verbs, locative alternation verbs and verbs of removal. Along 
with description, the book discusses most of the important theoretical 
issues germane to the two above-mentioned approaches, including the 
relationships observed between the multiple senses of a lexical item, the

* I should like to thank two anonymous EL reviewers, without whose invaluable 
comments and criticisms on an earlier draft this article would not have reached its 
present form. I am also grateful to Peter A. Goldsberry and Carol Rinnert not only 
for patiently acting as informants but also for suggesting stylistic improvements. 
All remaining errors and inadequacies are, of course, my own. This work was sup-
ported in part by a Grant-in-Aid for Scientific Research from the Ministry of Educa-
tion, Science and Culture, Grant No. 10610516.

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extension of meaning, metaphor and thematic relations, verb meaning and construction meaning. Theoretically and descriptively, therefore, Iwata’s work represents a significant contribution to this field of research.

The lexical network approach consists of two sub-networks, i.e. a G(rammatical) network and an S(emantic) network. The former concerns the phenomena that have been dealt with under the name of ‘argument structure alternations,’ while the latter concerns metaphor as conceived by Lakoff.

One of the main divergences of the lexical conceptual approach from the cognitive linguistic approach concerns assumptions regarding the form-meaning correspondence in a sentence. The former approach maintains that the verb plays the pivotal role in determining how many and what sorts of arguments can occur in a sentence. It also maintains that verb behavior is determined by its semantic properties and that the so-called ‘construction-alternation phenomena’ such as double object construction, locative alternation and middle construction, can be accounted for with respect to the semantic properties of the verbs used in those constructions. The research based on these assumptions is seen in the works of Pinker (1989), Jackendoff (1990), Hale and Keyser (1993), Levin (1993), and Levin and Rappaport Hovav (1995), among others. By contrast, one of the tenets of the cognitive linguistic approach is that the construction, as a Gestalt, carries a meaning independent of particular verb meanings and that construction alternations result from a “gestalt shift” or “the alternate construal of the profiled event.” This kind of view regarding the form-meaning correspondence is advocated by Goldberg (1995) and Langacker (1986). It is this latter approach that SI adopts in accounting for the ‘argument alternation’ phenomena.

The present review article focuses exclusively upon this issue of the form-meaning correspondence. It purports to examine SI's claims concerning ‘argument structure alternations.’ The following section deals with an outline of SI’s analyses of the senses of the verb hit and locative alternation verbs, along with the model SI adopts for his construction-based approach. In Section 3, I will first point out some problems with his analysis of the verb hit. Then, after proposing a model for semantic representation from the viewpoint of conceptual semantics, I will present an alternative analysis of hit based on the model. This analysis will show that we can eliminate the problems posed by SI’s analysis in the alternative account. Section 4 concerns
the discussion of locative alternation verbs. After pointing out several unexplained problems in SI’s account, I will apply the model proposed in Section 3 to an alternative analysis of this phenomenon. It will be shown that this alternative is superior to SI’s in terms of the accountability for the interactions of locative alternation verbs with other verb alternations as well as the links between the semantic arguments and the syntactic ones.

2. An Outline of Iwata’s Analyses Relating to Argument Structure Alternations

2.1. Iwata’s Analysis of the Multiple Senses of the Verb Hit

In what follows I will sketch SI’s analysis of the senses of the verb hit with particular emphasis on the phenomena relating to the G-network.

In SI’s analysis, the five senses of the verb hit, which constitute the G-network, are represented in conceptual structure, as follows:

1. hit (A): He hit the fence.
   \[\text{[CAUSE([HE], [GO([IMPACT], [TO FENCE]])])}\]
2. hit (B): He hit the fence with a bullet.
   \[\text{[CAUSE([HE], [GO([BULLET], [TO FENCE]])])}\]
3. hit (C): He hit a stick against the fence.
   \[\text{[CAUSE([HE], [GO([STICK], [TO FENCE]])])}\]
4. hit (D): A bullet hit the fence.
   \[\text{[GO([BULLET], [TO FENCE]])}\]
5. hit (E): He hit the ball into the field.
   \[\text{[CAUSE([HE], [GO([BALL], [TO IN FIELD]])])}\]
   \[\text{[BY[CAUSE([HE], [GO([IMPACT], [TO BALL]])])]}\]

Hit (B) differs from hit (A) in that in hit (B) an entity denoted by the with-PP is an impinging theme, that is, an entity which comes into contact with a place denoted by the direct object. In hit (A), none of the arguments is asserted to move; instead, an incorporated argument IMPACT appears in the first argument position of the embedded GO. To restate this difference in other terms, the object denoted by the with-PP in hit (B) must be interpreted as something that comes of its own force, like a bullet or an arrow. Thus hit (B) also has IMPACT in the first argument position of the embedded GO. This IMPACT with hit (B), however, serves only as a selectional restriction, whereas with hit (A) the IMPACT serves as a constant. Hit (A) can also permit a with-PP, as seen below:
(6) He hit the fence with a stick. This *with*-PP, however, is an instrumental adjunct and not an argument, for it can be omitted without ill-formedness or substantial meaning change. In *hit* (C), it is interpreted that an object designated by the direct object NP comes into contact with the place denoted by the *against*-PP. Thus the direct object NP is a Place in *hits* (A) and (B) but a Theme in *hit* (C). SI claims that the complement alternation exhibited by these senses is parallel to locative alternation, as in the following:

(7) a. Bill loaded hay onto the truck.
   b. Bill loaded the truck with hay.

*Hit* (D) means that an object denoted by the subject NP comes into contact with a place. Thus *hit* (D) is analyzed as a GO-verb counterpart of *hit* (B). Unlike the other senses of *hit*, *hit* (E) indicates a sense of movement designated by a Path-expression. Adapting the main part of Jackendoff's (1990: 143–144) analysis of spatial resultatives, SI represents the event of 'his causing the ball to go into the field' as the main clause and the event of 'his giving an impact to the ball' as the subordinate BY clause.

The relationships among the five senses of *hit* observed above are diagrammed in (8).

2.2. Iwata's Analysis of Locative Alternation

Arguing against the analyses of locative alternation in terms of lexical rules (e.g. Rappaport and Levin (1988), Pinker (1989)), Iwata proposes an alternative analysis in terms of the distinction between the L(lexical)-meaning and the P(hrasal)-meaning. An L-meaning refers to the meaning of a verb *per se* in the sense of Fillmore's frame semantics. It includes reference to a background frame rich with world and cultural
knowledge. A P-meaning, on the other hand, refers to a meaning associated with a particular syntactic frame. The locative alternation takes place provided the L-meaning is general enough to license more than one P-meaning.

To take an example, the L-meaning and the P-meanings of the verb *spray* are represented as in (9).

(9)

\[
\begin{align*}
\text{spray} & \\
& \text{A liquid is sent in a mist or fine droplets.} \\
& \text{spray paint onto the wall} \\
\end{align*}
\]

Thus, the L-meaning of *spray*, including both the manner of motion and the effect of motion, gives rise to two P-meanings. Each P-meaning is associated with a particular syntactic frame. If the manner of motion is given more prominence, the verb occurs in the syntactic frame \( V \ NP \ into/onto \ NP \). On the other hand, if the effect of motion is given more prominence, the verb appears in the syntactic frame \( V \ NP \ with \ NP \). In other words, which syntactic frame is chosen is determined by which aspect of the L-meaning is more prominent. In this sense, the idea inherent in SI's analysis is basically the same as Pinker's (1989) 'gestalt shift' or Langacker's (1986) 'alternate construal of the profiled event.' We can now summarize SI's account of the form-meaning correlation with regard to the locative alternation as in the following:

(10)

\[
\begin{align*}
\text{V NP into/onto NP} & \quad \text{V NP with NP} \\
& \text{Move substance} \quad \text{Affect object} \\
& \text{P-meaning} \quad \text{P-meaning} \\
& \text{construction} \quad \text{alternate construal/} \\
& \text{Gestalt shift} \\
\end{align*}
\]
3. Discussion of the Relationships between the Senses of *Hit*

3.1. Some Problems with Iwata’s Analysis

In this section I will closely examine SI’s analysis of hit (A) – hit (D) that we have seen in the previous section. I will leave hit (E) out of consideration since resultative constructions require more extensive discussion than the space of this article allows. Special attention will be paid to the relationships between hit (A) with an instrumental adjunct and hit (B) with an impinging-theme reading.

Let us now begin with hit (D). What seems problematic with the representation for (4) is that hit (D) is analyzed as a GO-verb. As SI notes, the entity denoted by the subject of hit (D) must be something that comes suddenly and forcefully of its own force. The mere entity used as an Instrument cannot stand in the subject position, as is clear from the sentence below:

(11) *A stick hit him.*

This suggests that ‘the bullet’ works as an ‘impersonal’ actor as well as a Theme and that hit (D) should be a CAUSE-verb. This is confirmed by the ‘what x did’ test, which is diagnostic for actions, as seen below:

(12) What the bullet did was hit the target.

If ‘the bullet’ is only a Theme and not an Actor, as SI assumes, why can it not appear in the first argument position of the embedded GO in hit (C)? Also, why can ‘the stick,’ which occurs as the first argument of the embedded GO in (3), not appear in the same position of the GO-function in (4)?

Assuming that hit (D) is a CAUSE-verb, however, does not necessarily mean that there exist no GO-verb senses of hit. Observe the sentences below:

(13) a. When he turned round the corner, a branch of a tree hit against his shoulder.
   b. The story hit the national wires.
   c. The fall in stocks hit the stockbrokers.
   d. We hit the main road two miles further on.¹

These senses are clearly GO-verbs, since they cannot pass the ‘what x

¹ The senses in (13b–d) are referred to as hit (I), hit (H) and hit (J), respectively, in SI’s account.
did’ test, as shown below:

(14) a. *When he turned round the corner, what a branch of a tree did was hit his shoulder.
   b. *What the story did was hit the national wires.
   c. *What the fall in stocks did was hit the stockbrokers.
   d. *What we did was hit the main road two miles further on.

The analysis of an impinging theme with hit (D) seems to be applied to the sense of hit (B) also with an impinging theme; that is, it can be analyzed as the first argument of a CAUSE-function, a possibility to be explored in Section 3.2. SI’s claim that an impinging theme with hit (B) occupies the first argument position of the embedded GO comes from Grunau’s (1985) observations on the differences between the with-PP used in (2) and that used in (6). One of the differences between them is that in the instrument reading of (6) he was holding the stick in his hand all through the action, while in the impinging reading of (2), he was not holding but shooting the bullet. Another difference lies in the order of the impinging-theme with-phrase and the instrument with-phrase when both phrases are combined: the order in which the former precedes the latter is more acceptable than the reverse order, as Grunau observes.

(15) a. I hit the target with a well-placed arrow with John’s bow.
   b. *I hit the target with John’s bow with a well-placed arrow.

From this observation, Grunau suggests that the impinging-theme with-phrase is at a lower projection than the instrument with-phrase. In spite of these differences, the two kinds of phrases have several properties in common. To illustrate, the following sentences show that the impinging-theme with-phrase can work in its semantic role as a kind of means expression:

(16) a. Which stick did Bill use to hit the fence?
   b. He hit the fence with the stick I gave him the other day.

(17) a. How many bullets did Bill use to hit the target?
   b. He hit it with three bullets.

Likewise, we can note that, as in the case of the instrumental with-phrase, the impinging-theme with-phrase can be an answer to a question using how, as seen in the following:

(18) a. How did he hit the fence?
Furthermore, it should be noted that the impinging-theme with-PP works as a syntactic adjunct in the same way as the instrumental with-PP. The with-PP in (2) can be omitted without affecting its grammaticality, as can the with-PP in (6). Moreover, the with-phrase in (2) falls either inside or outside do so, as the instrumental with adjunct.²

Observe the following pairs:

(19) a. I hit the target with bullets and Bill did so, too.
    b. John hit the target with bullets and Bill did so with arrows.

(20) a. John hit the fence with a stick and Bill did so, too.
    b. John hit the fence with a stick and Bill did so with a bat.

Thus, it is clear that the syntactic and semantic behaviors of the impinging-theme with-phrase bear similarities to as well as differences from the instrumental with-phrase.

Now let us turn to hit (A). One of the problems with the conceptual structure of (1) is the presence of the incorporated argument IMPACT in the embedded GO. Sentence (1), however, means most typically that 'he' comes into contact with 'the fence' forcefully, using his hand or some other part of his body. In other words, what 'he' applies to 'the fence' is not 'impersonal' IMPACT but force from a part of his body. Thus what distinguishes hit (A) from hit (B) is that, whereas with the former sense, what is asserted to move is a force coming from the entity designated by the subject, with the latter sense it is an entity capable of coming suddenly and forcefully of its own force. In addition, it is argued above that an impinging-theme with-phrase with hit (B) plays the role of an Instrument as well as that of a Theme. Thus it follows that the same analysis should be applicable to the representation of hit (A); that is, an incorporated argument of [α'S FORCE], where α is an index referring to the entity denoted by the subject, should play the same dual role. At this point one might question what comes into contact with 'the fence' in the case of (6). Since (6) neces-

² It goes without saying, as SI notes, that we cannot mix these two kinds of with-PP, as shown below:

( i ) a. *I hit John with a stick, and Mary did so with a bullet.
    b. *I hit John with a bullet, and Mary did so with a stick.
sarily implies (1) and 'he' was holding 'the stick' throughout the action, [STICK] along with [α'S FORCE] plays the role of an Instrument. Thus the function of [STICK] is coextensive with that of [α'S FORCE]. Further details of the representation for hit (A) are to be shown in Section 3.2.

The distinction between SI's [IMPACT] and [α'S FORCE] might seem trivial at first glance. It is worth noting, however, that the distinction is correlated to the aspectual difference between hit (A) and hit (B). Notice the following:

(21) a. He hit the fence for a few minutes.
    b. *He hit the fence with a bullet for a few minutes.

Where does the above contrast come from? In either hit (A) or hit (B), the event of an entity coming to contact with a place takes place in an instant. What differentiates hit (A) from hit (B), however, is that the entity denoted by the subject in the former sense can apply his force for the whole designated length of time, and hence the repetitive interpretation of sentence (21a) is available. By contrast, what applies to 'the fence' in (21b) is not 'his force' but the force of 'the bullet'; hence the unavailability of the repetitive interpretation of (21b). Thus the distinction between [α'S FORCE] and 'impersonal' [IMPACT/FORCE] is crucial in accounting for the aspectual difference observed above.

Next consider hit (C). A question might arise as to how sentence (3) is related to sentence (6). SI explains this relation in a construction-based approach. He suggests that, as in the case of the locative alternation verb in (7), two constructions are at work here: the "change of location" sense in the against-form of (3) and the "affect" sense in the with-form of (6). I assume, however, that the two forms correspond to nearly identical but different conceptual structures. In fact, sentences with hit (C) can take an instrumental with-phrase, as in (22):

(22) He hit the butt of a knife against the metal with a hammer.

This assumption is also supported by the case of instrumental verbs like hammer. Like the verb hit, this verb also can take either an against-form, as in (23a), or a with-form, as in (23b):

(23) a. John hammered the coin against the metal.
    b. John hammered the metal with the coin.

Notice, however, that the two forms in (23) are not necessarily identical in meaning. One reading of the (a) sentence, which is an instrumental reading of [HAMMER] as in the case of (22), means that John
used a hammer to hit the coin against the metal. The other reading of (a), which is synonymous with the (b) sentence, means that John used the coin as a hammer to hit the metal. If the two forms are the mere 'alternate construals' of an L-meaning, as SI claims, the former reading of the (a) sentence should not arise. Sentence (22) and the former reading of (23a) suggest that 'a stick' in (3), though seemingly Instrument, actually functions as a Theme.3

3.2. An Alternative Analysis of the Senses of Hit

The model proposed here to represent the conceptual structure of the verb incorporates Croft's (1991) notion of "causal chain." He defines this notion as follows: "a series of causally related events such that the endpoint or affected entity or the causally preceding atomic event is the initiator of the next atomic causal event" (p. 169). The meaning of the sentence ‘John broke the boulder with a hammer,’ for instance, is represented as follows:

(24) John hand hammer boulder (boulder) (boulder)

Vol Grasp Contact Change Result
State State

The point which has crucial relevance to the model to be shown below is concerned with the position of Instrument: while the thematic roles of Agent and Patient are defined as "the initiator of an act of volitional causation," and "the endpoint of an act of physical causation" (p. 176), respectively, those of Instrument, Means and Manner are defined relative to their positions in the causal chain. It is this conception of Instrument as occupying an intermediate position in causation that is adopted into the model to be presented below.

We can represent this position by duplicating a CAUSE-function in conceptual structure, as given in (25):

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3 Regarding the discussion on (23a, b), one might claim that, since the construction approach SI adopts is based on the assumption that each syntactic construction carries a particular meaning, the meaning differences should be compatible with SI's analysis. It should be noted, however, that the differences shown in the contrast of meaning observed between (23a) and (23b) by no means refer to 'alternate construals' of the same event but different construals coming from the two totally different events.
In (25), x is the argument corresponding to Agent, y the argument for Instrument/Means/Manner, and z the argument for Theme. Just as in Croft's (1991) causal chain model, potentially causal chains “extend indefinitely into the past and the future” (p. 172), so it might be reasonable to assume also in terms of this model that there is more than one inner CAUSE-function, depending upon the properties of the verb. Thus, the indefiniteness of causal chains is correlated to the optional character of these syntactic adjuncts. For instance, (15a) is a case in point. A physical entity appearing as a variable y corresponds to a with-PP on the syntactic level. A case of a constant appearing in y is the verb hammer; a constant HAMMER is included in this position. In contrast to the inner CAUSE-function, the argument of the outermost CAUSE-function is linked to the subject on the syntactic level. Thus, when only a single CAUSE-function is projected, its structure provides a framework to represent the conceptual structures of sentences with ‘impersonal’ actors, such as:

(26) a. The key opened the door.
    b. A typhoon hit Japan.
    c. Excessive drinking injured his health.
    d. Carelessness led him to make a mistake.

Based upon (25), let us attempt to represent hit (A) to hit (D) in what follows. Since the lexical entry for hit (A) will be as in (27), we can represent sentence (1) as in (28):

(27) a. [GO([X], [Path])] = [INCH([BE([X], [Path])])]
    b. [GO([X], [Place])] = [INCH([BE([X], [Place])])]

The functions GO-Place used here are an abbreviation for INCH-BE-Place.
In the above diagram the argument in a square bracket represents a variable, and the argument without it a constant. Following Jackendoff (1990: 60) in its main part, the relation of binding, which obtains between conceptual arguments in (27), (28) and the LCSs below, will be defined as follows. A binding argument will be notated by a Greek subscript; its bound argument (bindee) will be notated by a Greek letter in an argument position. The complex of binder and bindee(s) enables us to avoid the repetition of conceptual materials represented by arguments; at the same time it permits us to explicitly represent the same entity carrying out the multiple roles. Thus what is represented by the binder-bindee complex in (28) is that one and the same entity \([\alpha \text{’S FORCE}]\) carries out the role of Instrument as well as that of Theme.

Now consider the case of sentence (6). Its representation is (29):

The conjunction of a constant \([\alpha \text{’S FORCE}]\) and a variable \([\text{STICK}]\) in
the above configuration indicates that both are applied to the fence, that is, he is holding the stick throughout the action. Also the optionality of [STICK], which is not required by the LCS in (27), is represented by an AND-function.

In contrast to (29), hit (B) will have a lexical entry like (30), and sentence (2) will have the following representation as in (31).

(30) \[\text{CAUSE}(\alpha, \text{CAUSE}([<\text{FORCE}>] \beta, \text{GO}(\beta, \text{ON}(\text{I}))))\]

(31) \[\text{CAUSE} \quad \text{Event} \quad \text{Event} \quad \text{CAUSE} \quad \text{Thing}_\beta \quad \text{GO} \quad \text{Thing} \quad \text{Place} \quad \beta \quad \text{ON} \quad \text{Thing} \quad \text{[FENCE]}\]

\[<\text{FORCE}>\] in (30) indicates a variable with FORCE as a selectional restriction. In (31), instead of [\alpha'S FORCExE], [BULLET], which can come of its own force, is in the position of \(y\). In other words, while in (28) or (29) 'he' performs the whole action by using his own force, in (31), he acts just as an initiator in letting a bullet come into contact with the fence. This is evidenced by the oddness of the sentence below, in which a manner adverbial forcefully occurs:

(32) ??He hit the target with a bullet forcefully.

Accordingly, in terms of this analysis the distinction between the instrument-with reading in (6) and the impinging-theme with-reading in (2) is contingent upon whether or not the entity in the first argument position of an inner CAUSE-function is accompanied by an entity de-

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5 The distinction between the two types of instruments on semantic representation as envisaged in (29) and (31) is inspired by the distinction between 'extended causation' and 'onset causation' as noted in Maruta (2000). I also assume that these two types of instruments as we saw in (29) and (31) correspond to the ones termed by Marantz (1984) as 'intermediary' instruments and 'facilitating' instruments.
noted by the subject. This alternative analysis of hit (B) accounts not only for the differences between the instrumental with-PP and the impinging-theme with-PP, but also for the syntactic and semantic similarities between them. The fact that both phrases can be answers for questions with the verb use, as observed in (16) and (17), indicates that both of them can be analyzed as the first argument of a CAUSE-function emerging between an outer CAUSE-function and a GO-function. The similarity observed in (19) and (20) with respect to do-so suggests that an explicit argument of an inner CAUSE-function in either (29) or (31) is linked to a with-adjunct on the syntactic level.

Next consider hit (D) in (4). Since hit (D) is a CAUSE-verb with an 'impersonal' actor, as the 'what x did' test showed in the previous section, we get the following representation:

(33)

\[
\begin{array}{c}
\text{Event} \\
\downarrow \\
\text{CAUSE} \\
\downarrow \\
\text{Thing} \\
\downarrow \\
[BULLET] \\
\downarrow \\
\text{GO} \\
\downarrow \\
\text{Thing} \\
\downarrow \\
\text{Place} \\
\downarrow \\
\text{ON} \\
\downarrow \\
\text{Thing} \\
\downarrow \\
[FENCE]
\end{array}
\]

The above structural configuration accounts for why sentences such as (11) are not available: that is, a stick alone is not capable of coming forcefully into contact with a place. This enables us to explain why 'the bullet,' which appears as the subject of sentence (4), cannot occur.

\footnote{It should be noted in passing that the same can be said of the difference with regard to the impinging-theme reading between hit and strike. Unlike hit, strike allows an instrument reading but not an impinging-theme reading, as shown in (i):

(i) a. I struck John with a stick.
b. *I struck John with a bullet.

That is to say, the verb strike permits only structural configurations like (28) but not those like (31).}

\footnote{One might question at this point why both with-PPs cannot be mixed as sentences in (i) of note 2 shows if both of them can be treated as the arguments of inner CAUSE-functions. The reason for this is due to the direct binding relation holding between the argument of an inner CAUSE-function and the argument of the GO-function.
as the object of sentence (2), and why 'a stick,' which occurs as the object of sentence (3), cannot appear as the subject of (11).

Finally, let us consider the sense of hit (C) in (3). It was argued in the foregoing section that, despite the apparent similarity between the object NP in (3) and the instrumental NP in (6), the thematic role of the former counts as a Theme but not an Instrument. Thus the sense of hit (C) has a lexical entry like (34) and sentence (3) is represented as (35):

(34) \[\text{CAUSE}([ ] \alpha, [\text{CAUSE}([\alpha's \text{ FORCE}], [\text{GO}([ ], \text{ON} ([ ])])])])\]

(35)

```
Event
  CAUSE Thing\alpha
    [HE] CAUSE Thing
      \alpha's \text{ FORCE} GO Thing Place
      [STICK] ON Thing
      [FENCE]
```

This analysis makes it possible to account for the availability of sentences such as (22) and (23a).

Given the conceptual structures of hit (A) – hit (D) in the above diagrams, let us now turn to the discussion of how they are projected to the syntactic structures. Whether the conceptual structure is directly mapped to the syntactic structure or indirectly mapped through the mediation of the argument structure is open to argument. Following much current work (Marantz (1984), Pinker (1989), Levin and Rappaport Hovav (1995), etc.), I assume the latter approach. Thus, it is assumed that there are three variables in the argument structure: the external argument, the direct internal argument and the indirect internal argument. It is assumed, in addition, that the external argument is mapped to the subject of a transitive verb as well as that of an unergative intransitive verb in syntactic structure; that the direct internal argument is mapped to the object of a transitive verb as well as the subject of an unaccusative verb in accordance to the Unaccusative Hypothesis; and that the indirect internal argument is mapped to a locative prepositional phrase. Regarding the linking rules, I propose that rules (36),
(37) and (38), as given below, are responsible for determining the argument structures corresponding to the conceptual structures in the above diagrams.

(36) Outermost Cause Linking Rule
The first variable argument of the outermost CAUSE-function is linked to the external argument of the verb.

(37) Directed Change Linking Rule
The first variable argument in a GO-function structure is linked to the direct internal argument of the verb.

(38) Path/Place Expression Linking Rule
The variable argument of a Path/Place-function is linked to the indirect internal argument of the verb.

The application of these rules are ordered as follows:

(39) Outermost Cause Linking Rule > Directed Change Linking Rule > Path/Place Expression Linking Rule

In what follows I will show how these linking rules are applied to obtain the appropriate argument structures for the four senses of *hit* in question. With regard to the external arguments, rule (36) will be applied to the first Thing argument [HE] of the top CAUSE-function in (28), (29), (31), and (35). With regard to the direct internal arguments, rule (37) will be applied to the argument [FENCE] in (28), (29), (31) and (33), because the empty category ß is unable to undergo the operation of the rule. On the other hand, rule (37) is applicable to the first argument [STICK] to associate it with the direct internal argument and rule (38) is applicable to the argument [FENCE] to associate it with the indirect internal argument. Finally, a note should be made concerning a variable argument in the first argument position of an inner CAUSE-function. For instance, [STICK] in (29) and [BULLET] in (31) will be demoted to syntactic *with*-adjuncts on account of the lack of eligibility for the application of rule (36). In contrast to (31), the variable argument [BULLET] in (33) can be associated with the external argument as a result of the application of rule (36).

In the above discussion I have presented an alternative account of the relationships holding among *hit* (A)-*hit* (D), the senses which SI maintains exhibit complement alternation, in terms of the model incorporating Croft's (1991) notion of 'causal chain.' The problems posed by SI's account can be circumvented by an analysis in which instrumentals correspond to the first argument of a CAUSE-function intermediate between the outermost CAUSE-function and a GO-func-
tion. In what follows it will be shown that the same kind of analysis can be applied to locative alternation verbs.

4. Discussion of Locative Alternation

4.1. Some Problems with Iwata's Analysis of Locative Alternation Verbs

SI's analysis of locative alternation verbs, though seemingly plausible, raises several problems. First of all, as in the case of hit (B) in (2), it fails to account for the duality in the syntactic and semantic behavior that is exhibited by the with variant of locative alternation verbs. In regard to semantic behavior the duality is shown by the semantic roles played by the NP in a with-phrase: i.e. that of a Theme, which is shared with the locative variant, and that of an Instrument. As for the latter role, notice the following:

(40) a. What did Bill use to load the truck?
   b. He loaded the truck with bricks.

(41) a. Which paint did Bill use to spray the wall?
   b. He sprayed the wall with that blue paint.

Similarly, as in the case of the instrumental with-phrase, the locative with-PP can be an answer to a question using how, as seen below:

(42) a. How did you load the truck?
   b. With cartons.

(43) a. How did he stuff the turkey?
   b. With vegetables.

The similarities in semantic behavior are correlated with the similarities in syntactic behavior. As seen in the case of hit (B), the locative with-PP works as a syntactic adjunct. It falls either inside or outside do-so, as the instrumental adjunct. Observe the following:

(44) a. John loaded the truck with coal and Bill did so, too.
   b. John loaded the truck with coal and Bill did so with cartons.

(45) a. John sprayed the wall with paint and Bill did so, too.
   b. John sprayed the wall with blue paint and Bill did so with red paint.

(46) a. John loaded the wagon with hay with a pitchfork and Bill did so, too.
   b. John loaded the wagon with hay with a pitchfork and Bill did so with a shovel.
Moreover, the with-PP of manner type locative alternation verbs can be omitted without affecting grammaticality, as the instrumental adjunct:

(47) a. Sam loaded the truck.  
     b. He crammed the jar.  
     c. He stuffed the turkey.

The second problem concerns the interaction of locative alternation verbs with other kinds of alternation, in particular, causative alternation and locatum subject alternation. Let us start with the interaction with the former alternation. SI’s account is not adequate to account for the well-known fact in the literature that the intransitive form of a locative variant of a verb like spray is well-formed and that of its with variant is ill-formed, as seen below:

(48) a. Paint sprayed on the wall.  
     b. *The wall sprayed with paint.  

This alternation applies to locative verbs such as pour as well:

(49) a. They poured gas into the tank.  
     b. Gas poured into the tank.  

If the locative variant and its with counterpart are the mere ‘alternate construals’ of the same event, as SI claims, (48b) should be well-formed. Moreover, SI’s analysis fails to account for why some locative alternation verbs appear readily in both intransitive and transitive forms, while the others do not in the transitive form, as exemplified below:

(50) a. The pigs splashed mud on the wall.  
     b. Mud splashed on the wall.  

(51) a. Bill loaded hay onto the truck.  
     b. *Hay loaded onto the truck.

What characteristic differentiates (50b) from (51b)? Sentence (51b) is ill-formed because ‘hay’ cannot move of its own accord. In other words, an additional manner component is involved in the representation of verbs like load, though it is lacking in that of verbs like splash. This clearly is the same situation as we have observed with the contrast between sentences (4) and (11).

Another alternation whose interaction with locative alternation verbs SI’s analysis has a difficulty in accounting for is locatum subject alternation. This alternation relates the argument of the verb expressed in the with-phrase to an oblique subject. This alternation applies to the with variant of locative alternation verbs as well as locatum verbs like fill, as shown below:

(52) a. John sprayed the wall with paint.
Why are the object NP's of a *with*-PP in (52a), (53a) related to the subjects in their respective (b) sentences? What motivates this relationship? Adequate answers to these questions cannot be found in terms of an analysis based upon the assumption that a particular syntactic construction carries a particular meaning.

It should also be noted with regard to locatum subject alternation that the same distinction as we observed between (50b) and (51b) can be applied as well. Compare (54) and (55):

(54) a. Mud splashed the wall.
   b. Water sprayed the flowers.
(55) a. *Hay loaded the truck.
   b. *Mud smeared the wall.
   c. *Pipeclay daubed their bodies.

4.2. An Alternative Analysis of Locative Alternation Verbs

In what follows I will present an alternative analysis of locative alternation verbs *spray* and *load* in terms of the model proposed in Section 3.2. Let us now start with the verb *spray*. I propose that the lexical entry for its locative variant will be as in (56a) and that for its *with* variant as in (56b):

(56) a. \[\text{CAUSE}([\text{THING}], \text{GO}([\text{DROPLETS}][\text{THING}], \text{ON}([\text{PLACE}]))])\]
   b. \[\text{CAUSE}([\text{THING}], \text{CAUSE}([\text{DROPLETS}][\text{THING}], \text{GO}([\text{THING}], \text{ON}([\text{PLACE}]))]))\]

Thus sentences (57a) and (57b) will have their respective conceptual representations as in (58a) and (58b).

(57) a. John sprayed paint on the wall.
   b. John sprayed the wall with paint.
(58) a. 
   \[\text{Event} \]
   \[\text{CAUSE} \quad \text{Thing} \quad \text{Event} \]
   \[\text{[JOHN] GO} \quad \text{Thing} \quad \text{Place} \]
   \[\text{Thing} \quad \text{Thing} \quad \text{ON} \quad \text{Thing} \]
   \[\text{DROPLETS}[\text{PAINT}] \quad \text{[WALL]} \]
b. Event
   \[ \text{CAUSE} \quad \text{Thing}_a \]
   \[ \text{Event} \]
   \[ \text{[JOHN]} \quad \text{CAUSE} \quad \text{Thing}_b \]
   \[ \text{Event} \]
   \[ \text{Thing} \quad \text{Thing} \quad \text{GO} \quad \text{Thing} \quad \text{Place} \]
   \[ \text{DROPLETS} \quad \text{[PAINT]} \quad \beta \quad \text{ON} \quad \text{Thing} \]
   \[ \text{[WALL]} \]

In both structures, since \([\text{DROPLETS}]\) is a constant and \([\text{PAINT}]\) a variable, the structure \([\text{DROPLETS}][\text{PAINT}]\) represents 'droplets of paint.' The crucial difference between (58a) and (58b) bears upon whether this structure \([\text{DROPLETS}][\text{PAINT}]\) occupies the first argument position of a \text{GO}-function or that of an inner \text{CAUSE}-function. The mapping from (58a) and (58b) to their respective syntactic structures goes as follows. First, rule (36) will be applied to the variable argument \([\text{JOHN}]\) of the top \text{CAUSE}-function in both structures to associate it with the external argument. Next, with regard to (58a), rule (37) will be applied to the first variable argument \([\text{PAINT}]\) to associate it with the direct internal argument. With regard to (58b), the same rule will be applied to the variable argument \([\text{WALL}]\) to associate it with the direct internal argument. Regarding the variable \([\text{WALL}]\) in (58a), the rule (38) will be applied to link it to the indirect internal argument. The variable \([\text{PAINT}]\) in (58b) will be demoted to a syntactic adjunct.

The above distinction enables us to account for why the locative variant has its corresponding intransitive form, as in (48a), but the with variant structure does not. Without any \text{CAUSE}-function, the \text{GO}-function structure in (58a) results in well-formedness. On the other hand, without any \text{CAUSE}-functions, the \text{GO}-function structure in (58b) results in ill-formedness due to a violation of the Empty Category Principle, because the bound element \(\beta\) is not properly governed.

Quite the opposite is found in the interaction with locatum subject alternation. Since \text{PAINT} in (58b) is positioned in the argument position of a \text{CAUSE}-function, the relation of (52a) to (52b) is straightforwardly accounted for, given that the locatum subject construction corresponds to a single \text{CAUSE}-function. This amounts to the claim
that while sentence (48a) contains a GO-verb, sentence (52b) contains a CAUSE-verb. Although both sentences appear identical in meaning, this difference is made clear by the use of the progressive form test. One of the characteristics of a CAUSE-verb with an ‘impersonal’ actor is that it does not take the progressive aspect, as sentences in (59) cannot pass this test:

(59) a. *The key was opening the door.
    b. *The knife was killing the bear.
    c. *The hammer is breaking the vase.
    d. *The bullet was hitting the target.

The present analysis predicts that the same should be said of sentences like (52b). Observe the following pairs:

(60) a. Look at that! Water is spraying on the flowers.
    b. Look at that! *Water is spraying the flowers.

(61) a. Look at that! Mud is splashing on the wall.
    b. Look at that! *Mud is splashing the wall.

Furthermore, assuming that the NP of a with-PP in (52b) corresponds to the argument of an inner CAUSE-function gives a natural explanation for the unavailability of sentence (48b). For the argument of a CAUSE-function to correspond to a with-phrase, there must be another CAUSE-function projected higher than it. As we saw in Section 3.2., the linking of the argument of a CAUSE to a with-PP will take place so long as the rule Outermost Cause Linking Rule in (36) is applied to the argument of another CAUSE projected higher than that CAUSE.

Let us now consider the verb load. As mentioned in Section 4.1., what distinguishes verbs like load from verbs like spray in conceptual representation is that a manner component is involved in the former, whereas it is lacking in the latter. How to represent Manner in the present ‘causal chain’ model requires further research. However, I tentatively propose that it can be represented as another inner CAUSE-function projected higher than an Instrumental CAUSE-function. Thus, I assume that a locative variant as in (7a) and a with variant as in (7b) will have conceptual representations as (62a) and (62b), respectively:
The mapping from (62a) and (62b) to their respective syntactic structures is exactly the same as in the case of the verb *spray*. The reason why the first argument of a Manner CAUSE-function is clausal, as shown above, comes from the consideration that manner adverbials are subject-oriented. This indicates that there must be an empty category bound by the first argument of the outermost CAUSE-function. The presence of a Manner CAUSE-function in (62a) and (62b) accounts for why both causative alternation and locatum subject alternation are not applicable to the verb *load*. Regarding the former alternation, the explanation goes as follows. Without any CAUSE-function structure, the GO-function structure in (62a) merely represents the transfer of ‘hay’ onto the truck, not its manner. Without any CAUSE-functions, the GO-function structure in (62b) results in ill-formedness, because
the empty category $\beta$ is not properly governed. Now consider the interaction with locatum subject alternation. Without the top CAUSE-function, the Manner CAUSE-function structures in (62a) and (62b) are not well-formed because the bindee $\alpha$ is not properly governed; thus, there is another violation of the ECP.

Now let us turn to the distinction between (62a) and (62b). In (62a) the variable occupies the argument position of a GO-function, whereas in (62b) it occupies the argument position of a CAUSE-function. Thus the structures (58b) and (62b), as the case of (29), make it possible to account for the duality of a with variant in the syntactic and semantic behavior shown in (40)–(47).

Further support for the contrast between (62a) and (62b) is provided by the interaction with several kinds of modifiers. First of all, a depictive adjunct is compatible with the locative variant but not with the with variant, as shown below:

(63) a. I loaded hay onto the wagon green.
   b. *I loaded the wagon with hay green. (Maruta (1995: 142))

The explanation for this difference goes as follows. As previous linguistic literature has commonly assumed, depictives are predicated of object NPs (e.g., Noa ate the meat raw) or predicated of subject NPs (e.g., Noa wrote the answers drunk). The latter possibility is automatically excluded with the case of (63) since green is predicated of the object NP hay. In the proposed analysis in order for a depictive to be predicated of the object NP on the syntactic level, that NP must correspond to an explicit Thing argument of a GO-function; an incorporated argument or a bound element in that position cannot be realized as the object NP. This suggests that in the case of (7b) [HAY] should not be the first argument of a GO-function as in (62b).

The same line of reasoning can be applied to the interaction of the particle out and an adverbial one by one, as observed below:

(64) a. John spread out dishes on the table.
   b. *John spread out the table with dishes.
   (65) a. John smeared out grease on his overalls.
   b. *John smeared out his overalls with grease.
   (66) a. The boy loaded the boards one by one onto the wagon.
   b. *The boy loaded the wagon with the boards one by one.

Additionally, my alternative analysis offers an adequate account for the optional appearance of the locatum with-phrases, as noted in Carter (1976) and Fraser (1971), among others. That is, in normal non-ellip-
tical contexts, it is necessary to express the locative PP in the locative variant, while it is not the case with the with variant. Notice the following:

(67) a. ??Sam loaded hay.
b. Sam loaded the truck.  

(68) a. *He crammed toothpicks.
b. He crammed the jar.

(69) a. *She stuffed another book.
b. She stuffed the bookcase.

In terms of my analysis, the optionality of the locatum argument [HAY] in (7b) is attributable to an optional projection of the Instrumental inner CAUSE-function in (62b). On the other hand, in the non-elliptical context of a caused-motion structure like (62a), the Theme and the Place must have their explicit corresponding syntactic arguments. This constraint seems to hold with hit (C):

(70) a. He hit the stick against the fence.
b. *He hit a stick.

Although the exact formulation remains to be clarified, this constraint also supports the distinction between (62a) and (62b).

5. Conclusion

In the foregoing sections I have examined Iwata's treatments of argument alternations relating to the verbs hit, spray and load, and presented alternative analyses in terms of the model incorporating Croft's (1991) notion of 'causal chain.' I have shown that Iwata's analyses fail to capture important generalizations in the following respects: (i) the duality shown by the syntactic and semantic behavior of the with-phrases both for an impinging-theme and for a with variant of the locative alternation verb; (ii) the relationship holding between those with-phrases and causation; (iii) the interaction of locative alternation verbs with other kinds of verb alternation. On the other hand, the alternative analyses advanced in this article from the standpoint of conceptual semantics not only offer a natural and straightforward way to these generalizations but also provide a clue to the semantics-syntax interface in terms of the links between the semantic arguments and the syntactic ones.

There is no doubt that Iwata's work deserves credit for developing a way to integrate the insights of Conceptual Semantics and those of
Cognitive Linguistics. As far as the three verb cases are concerned, however, it might be reasonable to conclude that his dichotomy between the L-meaning and the P-meaning cannot be maintained.

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