On Event Structure

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1. Introduction

The main concern of this paper is to examine some properties of what is recently called event structure and identify some of its properties that plays a crucial role in solving some problems that are alleged to be syntactic in nature. Event structure is, roughly speaking, lexical semantics of a predicate and its relationship with its participants. This lexical semantic specification of a predicate is next mapped to argument structure, which specifies how many arguments that a given predicate takes or selects.

Let us start by examining one concrete example. Grimshaw and Vikner (1988) note that the following sentences have a slight difference in acceptability:

(1) a. The building was built *(by John/in one hour/with difficulty).
   b. The building was burned (by John).

Grimshaw and Vikner try to explain this difference in acceptability by noting some difference of the main verbs. This difference is claimed to have the following event structures:

(2) a. (action, state)
   j  j, h
   b. (action, state)
   j, h  j, h

In their event structures, the predicates build and burn are basically composed of two semantic components; John's action of building or burning a house and the resultant state of the house which stand in a certain relationship to John. The difference that Grismshaw and Vikner note is the fact that when a house is built, it does not exist before the action of building it is accomplished. On the other hand, the entity house does exist when the action of burning it is executed. Grimshaw and Vikner next discuss the semantic aspect of passives like (1). Passive, they argue, is an operation by which an actor of a predicate is eliminated or demoted. Thus the sentence in (1a) is argued to be less acceptable because the elimination of the participant John (¬j) in (1a) makes the semantics of the action without participants. This state of affairs does not appear in (1b) because the elimination of the actor John leaves a participant of the action, namely, house (¬h) and thus this sentence/predicate is easier to understand or to be identified. This approach is supported by the fact that the addition of a phrase like by John, in one hour or with difficulty makes
(1a) more acceptable. This is because these phrases imply the existence of participants of action and makes the event structure of (1a) with a semantic participant. The argument made above constitutes one of the motivations of using event structure. Basically event structure may include any information that a given predicate possesses. In this paper I would like to concentrate on ‘aspectual’ properties of event structure and show that this information plays a crucial in solving some of the alleged syntactic problems. This paper is organized as follows. In section 2, I will advance another piece of evidence in support of introducing aspectual properties of event structure into grammar by discussing semantic properties of middles. In section 3, I will turn my attention to some peculiar binding properties, especially those sentences that contain psych-predicates and the so-called 'snake'-sentences. After pointing out their syntactic problems, I will propose a solution by using event structure. In section 4, I will next examine nominals, arguing that the lexical semantic information enriched with event structure can give an interesting way to explain some recalcitrant behaviors of nominal passives. In section 5, I will discuss alternations found in double objects and the associated prepositional verb constructions, which will be given natural account by associating them in terms of event structure. In section 6, I will discuss briefly some implications for event structure-based approach in control into NP, which is another long standing problems in recent linguistics.

2. Middles

English has middles like (3) below, whose form is an active sentence in lacking a passive morphology, but looks like a passive in that its logical object appears in the subject position.

(3) This bread cuts easily.

As is well-known, middles are more severely constrained than normal passives as attested below:

(4) a. The wall was hit with a stick.
b* The wall hits easily.

What type of verbs can be used in middles? Hale and Keyser (1987) argues that for a verb to enter into middles the verb must express ‘change of state’. When we cuts bread, the bread can naturally be considered to have undergone some change of state by coming to have a different shape, and thus the grammatical middle in (4a) is obtained. On the other hand, when one hits a wall, the wall is normally expected to undergo no change of state, which yields the ungrammaticality in (4b). Important though this generalization may be for proper middle formation, it is not sufficient. For instance, Doron and Rappaport (1991) note the following contrast:
(5) a. Money transfers easily.
   b Money brings easily.

It is very difficulty to discern any difference between these verbs transfer and bring with respect to the semantics of change of state. Doron and Rappaport argue this difference comes from their event structures, which are shown below:

(6) a. transfer: CAUSE (DO (x), BECOME (AT (y, z)))
   b. bring: CAUSE (DO (x), BECOME (WITH ((AT (x, z) y))

In our notation, this difference is expressed by the following:

(7) a. (process state)
    j, m m, b
   b. (process, state)
    j, m j, m, b

When John transfers money to a bank, which is described by the process predicate in (7a), the participant of the transfer is John (-j) and money (-m). After the money is transferred into the bank, the money is considered to be in the bank, which is described by the state predicate, whose participants are money (-m) and the bank (-b). As we noted above, passives can be characterized as highlighting the less prominent object role by positioning it in the more prominent subject role position, whose original actor is dethematized. In (7a), this dethematization is successfully executed because when the actor John is eliminated, John disappears completely, which is a sign that the dethematization was successful. This is not the case in (7b) because when the actor John is eliminated in the process predicate, another John can be found in the state predicate, which suggests the dethematization was not successfully executed. The intuition behind this idea would be more clearly understood if we notice that when one brings money to a bank, that person will most naturally be thought to exist in that place as a participant of that state of affairs, and this participant prevents the proper dethematization of middles. This successful/unsuccesful dethematizations also play a role in creating the following contrast involving adjectival passives, which is noted again by Doron and Rappaport (1991). As is well-known, adjectival passives involve an operation that moves an internal argument of a verb into the external argument position and thus the incomplete dethematization makes (8b) ungrammatical.

(8) a. untransferred money
   b unbrought money

3. Funny Binding

Since Lees and Klima (1963) the distributions of pronouns and anaphors have been drawing much attention. One of the most interesting paradigms they advance is a
sentence like (9), where a pronoun is used when its antecedent is found in the same clause.

(9) John brought money with him.

Although there are several attempts in the past to deal with this case mainly by elaborating its syntactic structure, no satisfactory account has been advanced. (See Endo (1991) for the discussions of the previous approaches and their problems) One of the most important semantic aspects of this construction is seen in Watson (1989). He notes the following contrast:

(10) a. John searched around himself/*him for the mosquito bite that was itching him so terribly.

b. John was searching around him/*himself for the stone he had tripped over.

As the context shows, the PP around himself in (10a) expresses the target or goal of the mosquito’s action of biting. On the other hand, the PP around him in (10b) denotes the location where the event of John’s tripping takes place. This generalization would be best characterized in semantic terms, i.e. in terms of event structure as shown below:

(11) a. (action)
    j, j, mb

b. (action, state)
    j
    s, j

In (11a) a single action of searching is expressed, in which the actor of the searching action for the mosquito bite (=mb) is John and the target of the action is also John (=j). Thus John appears twice in the semantic component of the action of searching. Assume that the use of an anaphor is governed by semantic terms and an anaphor is used when a coreferential NP appear in the same semantic predicate, which I tentatively formalize in the following way:

(12) An anaphor must be (semantically)-commanded by the coreferential NP, where A s-commands B when A appears in the same semantic predicate as B does.

(I will elaborate the event structure later and accordingly make some modification of (12)).

In (12a) John (=j) is s-commanded by the coreferential John (=j) and thus the second John is mapped as an anaphor. In (12b), on the other hand, John is not s-commanded by another coreferential occurrence of John and thus no anaphor can be used in this context. Note that (12b) means that the action of tripping takes place at a certain place, which is denoted by the action predicate. The place is expressed by the state predicate which expresses the state of affairs where the stone (=s) which John tripped over was located near him, i.e. John. A similar account can be given to the following sentences as well, extensively discussed in Kuno (1987), who concludes that semantics-based account must
be invoked in this case.

(13) a. John saw a snake near him.
    b. Pictures of himself worried John.
In (13a) *near him* expresses a location where the snake can be found and thus is in the state predicate of its event structure. The apparent subject *John* is an actor of the seeing action and thus appears in a different action predicate. These two instances of *John* do not appear in the same semantic predicate and thus no s-command relation can hold, which forces us to use the pronoun *him* here. The latter sentence, (13b), recently draws much attention in binding theory. It is usually assumed that an anaphor like *himself* requires a c-commanding antecedent to satisfy the binding principle A but the antecedent *John* apparently cannot c-command *himself* because VP intervenes between these elements. Belletti and Rizzi (1988) try to solve this problem by showing that in the Italian corresponding sentence the surface subject behaves as a derived subject moving out of VP, concluding that binding condition A is successfully satisfied in VP at D-structure. See Belletti and Rizzi for further discussion of this point. This idea, however, is not sufficient to deal with other similar cases. For instance this type of backward or funny binding is generally allowed when a sentence can be interpreted as expressing some psychological state:

(14) a. Pictures of himself made John sad.
    b. Pictures of himself gave John a headache.
Here the antecedent *John* is a part of a small clause in (14a) and an indirect object in (14b). In either case the main verb theta-marks its subject position, and thus the movement of its surface subject from the VP-internal positions ultimately violates the theta-criterion. This means that VP does not have a slot for the surface subject to originate at D-structure so as to be properly bound by the object NP. Thus Belletti and Rizzi-style explanation breaks down here. What is interesting is the fact that this type of funny binding is not always allowed with psychological predicates, as seen below:

(15)*Brothers of himself fear John.
Here *John* cannot serve as the antecedent of *himself*. When is funny binding allowed? A careful examination of the sentence patterns above reveals that a semantic representation of the following sort for (13b) plays a crucial role:

(16) (action, state)
    p, j    j, w
This says that pictures (-p) causes John (-j) to be in a state of worry (=w). Thus all licit funny binding cases are composed of two semantic predicates of cause and state. This suggests that our event structure-based approach can provide a natural account for the funny binding cases by refining the representations that they take as follows:
Here in the state predicate John (-i) successfully s-commands the anaphor in the picture noun (-p) that contains an anaphor and thus grammatical sentence is obtained. What is interesting in this context is that unsuccessful funny binding sentences like (15) has simple stative predicate, lacking action predicate, as represented in the following manner:

(18) [X BE [IN (STATE) Y]]

Here the antecedent John cannot s-command the anaphor in NP (-b) and thus its ill-formedness is correctly explained. To recapitulate the discussion thus far, we can note the intuition behind binding theory. All successful cases have a semantic structure in which the antecedent is found in a more prominent position than the anaphor in the same domain. This situation can be created in several ways. When the semantics of a sentence has a causative meaning its causee can appear in the state position in which it can bind the anaphor in the state predicate. Unsuccessful binding cases are those that have no such elaborated operation. Thus binding is only allowed when the antecedent occupies a prominent position; when the antecedent appears in the less prominent position which is typically realized as an object NP, no successful binding is allowed. The intuition behind this binding phenomena can be summarized as follows:

(19) An anaphor should be bound by the antecedent that occupies a more prominent position.

(20) A is more prominent than B when it is more deeply embedded than B in event structure.

4. Nominal Passives

Another area where the relevance and necessity of event structure can be found is in nominals like the following:

(19) a. the enemy’s destruction of the city
    b. the city’s destruction by the enemy

Since Anderson (1977), (19b) has been characterized by moving the post nominal NP into the prenominal genitive position, which resembles passive sentences in the corresponding sentences:

(20) a. The enemy destroyed the city.
    b. The city was destroyed by the enemy.

Anderson notes that this pair can only be seen when the head noun is a member of what is called ‘affectedness’. Although she is not very clear about what the ‘affectedness’ means but the term is usually used to express a situation where some change of state is
expressed. Thus when the enemy destroyed the city, the city undergoes change of state and thus the noun the city is called affected. In contrast, a noun like knowledge is not considered to be a member of this class because, for instance, when one knows Chomsky, that person will undergo no change of state by being known to someone. For this reason we cannot find the following pair:

(20) a. John's knowledge of Chomsky
   b*Chomsky's knowledge to/by John

Although this affectedness requirement plays a crucial role in characterizing the passive nominals seen above, this semantic notion is not sufficient in identifying the characteristics of nominal passives. Consider, for instance, the following pair:

(21) a. Dr. John's entry into the crypt of pharaoh
   b*the crypt's entry by Dr. Jones
   cf. The crypt was entered by Dr. Jones

The event structure of entry is the following:

(22) entry
    (process, state)
    j, c  j, c

When Dr. Jones (-j) entered the crypt (-c), which is expressed in the process predicate, he will be naturally thought to end up in the crypt, which is expressed by the state predicate. When we try to dethematize Dr. Jones by deleting it in the process predicate, another Dr. Jones exists in the state predicate and thus dethematization is not complete. Thus the presence of this subject-like entity in the event structure is preventing the crypt from moving into the subject position, and thus gives rise to an ungrammatical sentence.

5. Double Objects

Since Green's (1974) extensive work, it is well-known that a certain class of English verbs have prepositional verbs which have double object alternation of the following sorts:

(23) a. John threw a book to Mary.
    b. John threw Mary a book.

Pinker (1989) examines this type of alternation from semantic point of views and notes some cases which cannot undergo this alternation:

(24) a. John carried the book to Mary.
    b*John carried Mary a book.

For double objects to be allowed, Pinker argues, the sentence must have a semantic representation like the following:

(24) a. x causes y to move to z (prepositional verb sentences)
b. x causes z to have y (double object sentences)

The ungrammaticality of double object sentences is attributed to the failure of these sentences to have this semantic representation. To see this point more clearly, let us consider the semantics of the sentence in (24). When John carries a book to Mary, he is most naturally thought to be the possessor of the book. For this reason, Mary, without being interpreted to be a possessor, cannot enter into double object sentences. This semantic aspect in terms of possessor is most prominently seen in the following sentence advanced by Green:

(25) a. The American ambassador baked a cake for James I.
    b. The American ambassador baked James I a cake.

The sentence in (25b) is only felt to be appropriate when a situation is created in which James I is not a deceased person and is able to possess something, as required by the semantics of double objects in (25b). (See Endo (1991) for the discussion of the semantics of animacy constraint)²

One of the weak points of Pinker's semantic approach is that it has no explanatory power, i.e. it just describes the state of affairs that is happening in double object sentences. We would be naturally tempted to derive this effect from some independent principles. In other words, we want to answer the question: Why does the semantics noted above prevent a verb from entering into double objects? This would be explained straightforwardly and quite uniformly if it turns out that double object formation involves the dethematization of the external argument like passives, middles, adjectival passives, etc. and the event structure is illicit in (24b). This idea makes sense when we realize that the first object of the double object has a subject-like property as expressed by the semantic representation of Pinker's. Consider the next event structure for (23) and (24):

(26) a. (process, state)
      j, b b, m
    b. (process, state)
      j, b j, b, m

(26a) represents the event structure of (23) involving throw while (26b) expresses that of (24) involving carry. As noted above in the discussion of middles and adjectival passives, the semantics of carry has the event structure whose state predicate contains three participants, because, for instance, when John (-j) brings a book (+b) to Mary (-m), the three participants are most naturally interpreted to end up in the resultant state of this action. The indirect object must come to have a subject-like property from the original goal-like property. The indirect object (-m) cannot enter into the first object position of double objects, because the movement of m into a subject-like position is impossible. This undesirable state of affairs occurs (24b) because the subject-like participant John exists in
the state predicate as well as in the process predicate. A trivial change of the definition of the theta-criterion like the following expresses this idea more formally:

(27) a semantic position and the related argument that occupies that position must be bi-unique.

This revised theta-criterion rules out a semantic representation, especially an event structure representation in which a semantic position is related by two terms or arguments. This illicit state is exactly what we see in (24b), where the two arguments John and Mary compete for the single position of the subject of possessor, violating the semantic theta-criterion in (27). A similar proposal, which moves the indirect object of double objects by syntactic movement, is seen Larson (1988), which is depicted in the following way:

(28) VP
    \( \downarrow \)
    V’
    \( \downarrow \)
    VP
    \( \downarrow \)
    V’
    \( \uparrow \)
    V
    \( \rightarrow \)
    NP
    give (to) Mary

6. Control

Roeper (1987) notes the following contrast:

(29) a. the enemy’s destruction of the city to prove a point
    b*the city’s destruction to prove a point

This difference, he argues, comes from the control theory, where the infinitival to prove a point is assumed to have an invisible subject PRO by the extended projection principle requiring that a predicate should have a subject. This PRO loses the antecedent the enemy when NP-movement takes place as in (29b) because this movement erases the controller of PRO. The uncontrolled PRO gives rise to a control theory violation. This analysis, however, faces a difficulty when we notice an example of the following sort that is advanced by Williams (1987):

(30) yesterday’s attempt to leave

Because the predicate leave requires a subject by the extended projection principle, PRO must appear in front of it. This PRO, however, cannot have its controller, which is
occupied by yesterday. This problem can be avoided without difficulty by our event structure approach because, as the following event structure for (29a) and (30) shows, licit controller enemy (=e) can be found.

(31) destruction
   (process, state)
   e, c        c

Because no passive operation is involved here, the dethematization of the enemy (=e), does not happen. With the appropriate controller the enemy present in event structure, grammatical control relationship can be established in (30).

As we noticed above, event structure for passives involves the suppression of the external argument. Thus when this passive form deletes an appropriate controller, an illicit control relation is inevitably created as in (29b). These considerations suggest that control theory sees event structure and only when PRO can find a licit controller in its event structure, licit control interpretation comes out.

Another interesting contrast can be found with respect to control in the following sentences which is observed in Roeper (1990):³

(32) a. The letter was carried nude.
    b*The letter was sent nude.

Where does this contrast come from? I will look for an answer in their event structures. Consider the event structure of carry and send:

(33) a. carry: (process, state)
    j, l, m  j, l, m

b. send: (process, state)
    j, l, m  l, m

When John (=j) carries a letter (=l) to Mary (=m), which is expressed in the process predicate, then John would be naturally thought to end up in the place where the letter is carried. As noted above, passive suppresses the external argument, and thus the actor John (=j) is eliminated from the process predicate. But another John exists in the state predicate, which I argue to serve as the controller for the PRO of nude. On the other hand, when John sends a letter to Mary, John is hard to be interpreted to exist in the place where the letter was sent. John is absent in the state predicate and this absence plays a crucial role in making the sentence in (32b) ungrammatical. When the external argument John is suppressed from the process predicate, no other instance of John can be found to control the PRO of the secondary predicate nude, which violates the control theory.

7. Conclusion

In this paper we have discussed the nature of event structure with special attention
to its aspectual properties. What we found through the discussion share a certain representation that must be born by licit event structures. When passive operation is involved, its actor role is suppressed. This suppression must be complete in that no actor-related element may not appear in other semantic predicates. All of the illicit cases that we saw involves this illicit representation. As we saw in the final section, the dethematization also makes a controller invisible.

Notes

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2 I thank Taro Kageyama for pointing out the next counter-example to me.
(i) Please bring me the chair.
3 I thank Tsuyoshi Oishi for drawing my attention to Roeper's examples.

References