

ENGLISH RESULTATIVES REVISITED

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ABSTRACT Taking Exo-Skeletal (XS) Model as the theoretical framework and English resultatives as the empirical data, this paper develops the function of a predicate in syntactic derivation, showing that a predicate still plays a role in syntactic derivation in the constructivist approach to the syntax of argument structure. The correlation between the event participant and predicate is developed, which offers an account of the thematic relationship in English resultatives. Dispensing the CAUSE head and complex event decomposition, this derived from syntactic computation, but from the inference of a general cognitive principle, under the pressure of producing an accessible semantic component to the C-I interface.

1 INTRODUCTION

The recent study of events and argument structure in generative syntax, as is pointed out in Marantz (2013), has shifted from the lexicalist approach (cf. Chomsky 1970; Levin & Rappaport Hovav 1995) to the constructivist approach (Hale & Jay Keyser 1993, 2002; Halle & Marantz 1993; Borer 2005a,b, 2013; Ramchand 2008), according to which, event structure interpretations are determined by the syntactic configurations, while the predicate only provides content to modify the functional structure that derives the interpretation of events.

The shift from the lexicalist approach to the constructivist approach, although having effectively addressed the issue of the argument structure alternation, leaves another issue to be further explored: in what way does the content of the predicate modify the syntactic configuration? In many cases, simply stating that the content of the predicate is compatible with the functional structure seems to be sufficient. However, this question needs to be further addressed out of both conceptual and empirical concerns. Conceptually, we need to know exactly when the content of the predicate comes into play in the derivation of the interpretation of a sentence, and whether content affects the grammaticality of a sentence. In the Government and Binding

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(GB) (Chomsky 1981) stage, the syntax-related factors definitely involve the lexical predicate. After all, we need the lexical predicate to assign theta roles to form the argument structure, which contributes to the representation of the Deep Structure. In Minimalism (cf. Chomsky 1995, 2000), with the eradicating of Surface Structure and Deep Structure, the lexical predicates role in syntactic derivation varies in different frameworks. If we still adopt the lexicalist approach which assumes that theta roles are assigned by verbs, or a similar assumption in Hornstein (1999), Reinhart (2002), Hornstein & Nunes (2008) and Boeckx *et al* (2010) that verbs take theta features, then the lexical predicate still plays a crucial role as it did in the GB period. However, if we adopt the constructivist approach, according to which the interpretation of arguments is reduced to syntactic structures, we have to ask whether the lexical verb still plays a role in syntactic derivation. Constructivist theories like Distributed Morphology (DM) (cf. Halle & Marantz 1993; Marantz 2007) and the XS model (Borer 2005 a, b, 2013) converge on the point that the content of event predicates does not play a role in syntactic derivation. DM takes the late-insertion operation, according to which the lexical items are inserted only after the syntactic derivation is completed; Borer does not provide an account of this issue as explicit as the late insertion operation, but only assumes that the content of event predicates is to modify the functional structure, which is roughly in line with the late-insertion operation. The different functions of lexical predicates in lexicalist and constructivist approaches pose an issue in syntactic research: both approaches have to explain the fact that when a wrong verb is chosen, a sentence will be ungrammatical. In the lexicalist approach, such unacceptability is due to the crashing of syntactic derivation, considering that the theta features of the verb are not properly valued; in the constructivist approach, this unacceptability is not related to syntactic derivation, because the content of the predicate is excluded from the realm of narrow syntactic computation. This theoretical difference is interesting: with the change of theories, usually the same unacceptability issue is traced to different mechanisms in the syntactic derivation, but in the shift from the lexicalist to constructivist approach, the same issue is related to either syntax or non-syntactic areas.

The current assumption about the function of event predicates in constructivist theories needs to be further clarified also out of empirical reasons. When resultatives, in contrast with depictives, are taken into account, the vague function of the predicate will be insufficient.

(1) RESULTATIVES

- | | |
|----------------------------------|-----------------------------|
| a. John ran his NIKE threadbare. | (intransitive resultatives) |
| b. John hammered the metal flat. | (transitive resultatives) |

(2) DEPICTIVES

- a. John drove the car drunk. (subject oriented depictives)
- b. John ate the meat raw. (object oriented depictives)

Although in both constructions, the secondary predicate is predicated of a DP, only in resultatives can this DP be licensed¹ by the secondary predicate independently. For example, in (1a), the object DP *his NIKE* is licensed by *threadbare*, because in this sentence, this DP does not bear any thematic relationship with the intransitive verb *run*. This is what the famous Direct Object Constraint (DOR) (Simpson 1983) means, which dictates that in resultatives, the resultative predicate is always predicated of the logical direct object². In depictives, as is shown in (2), although the DP, subject or object, is predicated of by the depictive AP, this DP is clearly independently licensed by the matrix V, not by the AP. For example, in (2b), if the verb is intransitive, then an object DP will not be allowed³.

In Borers (2005b: 215-231) account, the matrix verb and the secondary predicate form a complex predicate, which is an atomic predicate placed in a single event. According to this account, the composition of the relevant items in (1a) and (1b) gives the representation in (3).

(3) RESULTATIVES

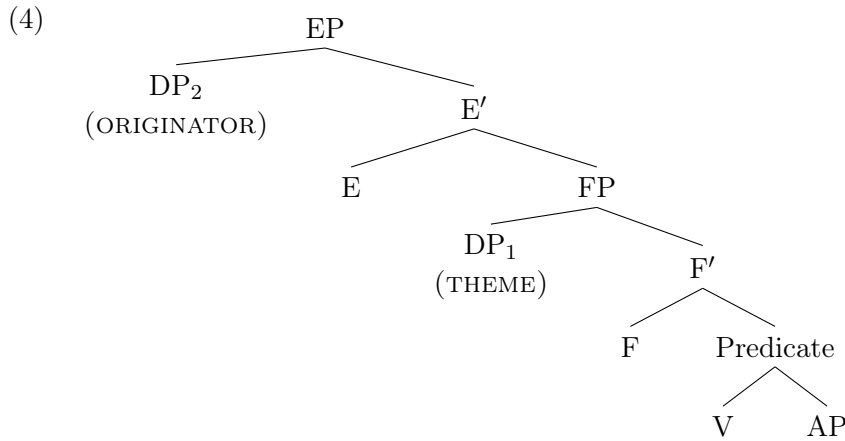
- a. run + threadbare → run-threadbare
- b. hammer + flat → hammer-flat

If we take a close scrutiny of the predicative relationship involved in resultatives, the complex composition hypothesis faces a problem. The structure of resultatives in Borers system is roughly as follows:

1 The term license is kept neutral here. Intuitively, it means that an argument has to be predicated of by a predicate in order to appear in a construction. We will give a strict definition of this term later in our framework.

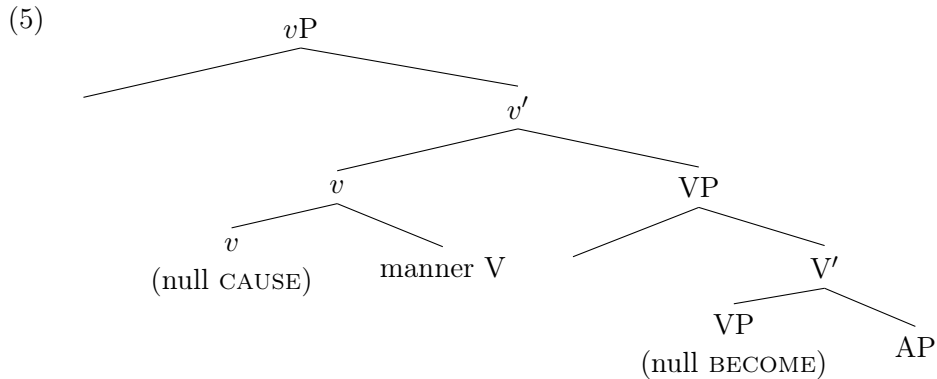
2 The logical direct object also includes the subject in unaccusative constructions, such as *The river froze solid* in which the secondary predicate *solid* is predicated of the DP *the river*, which is assumed to be the logical object of the unaccusative verb. In this paper, we do not deal with such resultatives, although the framework developed in this paper also applies to this type, as is shown in Hu (in Progress).

3 If an intransitive verb like *run* can take a direct object, it only happens when the verb is converted into a transitive verb in examples like *John ran a shop*.



The basic point of the above structure is that both the subject (ORIGINATOR) and the object (THEME) get their interpretations due to their positions in the functional structure, i.e. [Spec EP (event phrase)] and [Spec FP]. The matrix V and the secondary predicate (AP in (4)) do not play any role in projecting the arguments. This is perfectly in line with the spirit of the constructivist approach. However, the data in (1) show that there is obligatory relationship between the subject DP and the matrix V, and between the object and the secondary predicate. Obviously, the reliance on the interpretation provided by the functional heads cannot solve this problem. One possible way out is to postulate a specific rule in the composition of the complex predicate, which dictates that a certain argument should be thematically related to a certain predicate. Such a rule is not provided in Borers analysis, and in fact such a rule has to indicate that the lexical predicate has a certain function in establishing the thematic relationship, a result not welcomed in XS model at least at the first sight.

The difficulty involved in Borers analysis seems to be overcome by the syntactic encoding of a complex event. This in fact is the most widely adopted operation in the previous studies (cf. Rothstein 2003, 2004; Harley & Folli 2004, 2006; Embick 2004; Kratzer 2004; Mateu 2005, 2012: 252-278). According to such studies, resultatives encode a complex event consisting of two sub-events: a causing event and a resultant event. When this decomposition of the complex event is mapped onto syntax, each sub-event is headed by a functional category, i.e. the CAUSE head and BECOME head. Abstracting away the technical details, the syntactic structure of resultatives in this tradition is as follows:



The little *v* position denotes the causing function, which takes the event denoted by VP as its caused event, and the DP in the [Spec *v*] position is the CAUSER. The matrix V is incorporated into the little *v* position (to name the verbal item in Harleys (2005: 42-64) sense, or to modify the CAUSE predicate in Huang (2006)). This incorporation, according to such studies, denotes the manner of the causing event.

There are two major advantages in such studies. Firstly, the syntactic structure in (5) preserves the spirit of the constructivist approach: the interpretation of the two arguments (AGENT or CAUSER in [Spec *v*P] and the THEME in [Spec VP]) are not licensed by the lexical predicates, but are due to their syntactic positions (the sisters of two functional heads respectively). Secondly, the semantic components of resultatives, such as the thematic relationship and the causative meaning can be fully traced from the syntactic derivation.

However, a closer scrutiny reveals that both advantages in effect involve problems. The first problem concerns the syntactic encoding of events. With the two sub-events encoded in the syntax, one prediction is that the sub-events can be modified separately. However, this is not the case:⁴

- (6) a. John hammered the magic charger which caused the metal to become flat *automatically*.
 b. * John hammered [[the metal flat] *automatically*].
 c. John [[hammered [the metal flat]] *automatically*].

If the syntactic structure of the complex event in (5) is on the right track, the sub-event headed by the null BECOME should be able to be modified by the manner adjunct *automatically*, with the structure of (6b) being allowed. Note that (6b) is ruled out not due to the impossibility of the interpretation

⁴ This is also a problem of the small clause approach to resultatives (cf. Hoekstra 1988; Zhang 2001), which we will not introduce in details in this paper.

in real world knowledge. Following the syntactic derivation based on (5), the interpretation is that John hammered something which caused the metal to become flat automatically. This situation is possible, as is shown in (6a). The blocking of this interpretation clearly indicates that the operation of two sub-events in the structure of resultatives is problematic⁵.

This diagnostics also applies in simplex causatives, which indicates the syntactic encoding of event-decomposition is not tenable in general.

- (7) a. John caused the table to assemble *automatically*.
 b. John assembled the table *automatically*.

(7a) encodes two clauses headed by *cause* and *assemble* respectively. We can thus predict that either of the two clauses can be modified by the manner adverbial *automatically*. This prediction is confirmed as (7a) is truly ambiguous, which can either mean John did something automatically which resulted in the assembling of the table, or John did something that resulted in the automatic assembling of the table. If we assume that causatives in the causative alternation pair denote two sub-events, then the adverbial *automatically* in (7b) should also be able to modify either of the two sub-events. However, the reading that the table assemble automatically due to Johns causing act is not available in (7b), contra the prediction of the event-decomposition approach.

The second problem of the DM based study of resultatives introduces another important issue in the syntax of events, i.e. the source of the causative interpretation. Ever since the tradition of generative semantics (cf. Dowty 1979), a causing sub-event is invariably included if the event-decomposition approach is taken. In generative syntax, a causative functional head, in the shape of little *v*, is imposed in the structure, which entails that the causative interpretation is derived from the syntactic computation, as is explicitly exhibited by (5). However, resultatives do not always involve causative interpretation, shown by the following examples from Borer (2005b: 225).

- (8) a. Reluctant to let him go, the audience clapped the singer off the state.

⁵ One way out postulated in the studies of the DM tradition (cf. Marantz 2007; Harley 2008) is that there is only one functional head (the little *v* head) in the syntactic encoding of the event of resultatives (and causatives in general). This solution is still problematic in two aspects: firstly, it is not compatible with the event decomposition adopted in such studies; secondly, dispensing with the functional head BECOME, such studies allow the ROOT of the secondary predicate to license the THEME argument, contra the spirit of the constructivist theory that the content does not take any function in assigning theta roles. This operation also makes the syntactic derivation in DM inconsistent: in the syntactic derivation of inchoative constructions, the THEME argument is licensed by the little *v* head with the flavor of BECOME instead of CAUSE. This means that THEME is sometimes licensed by a ROOT, and sometimes by a functional head, making the whole system inconsistent.

- b. At the opening of the new Parliament building, the crowd cheered
the huge gates open. Borer (2005b: 225)

If the CAUSE head is in the syntactic structure of resultatives, the examples in (8) are not expected. One can remedy this problem by assuming that examples in (8) have an underlying structure different from resultatives. This is in theory possible. But in practice it is rather hard to exclude such examples from the family of resultatives. Another construction that has the similar surface form (i.e. V+DP+secondary predicate) is the depictive, but the examples in (8) are definitely not depictives. Firstly, in both sentences, an intransitive verb co-occurs with a direct object, which is not possible in depictives. Secondly, a typical characteristic of depictives is that the predicative relationship between the DP and the secondary predicate begins and ends at unspecified temporal points, which is not attested in (8) where the action co-occurred with the states coming into being, which is also the case in resultatives. Of course it can be assumed that the examples in (8) have another underlying structure different from resultatives and depictives, but without any supporting diagnostics, it is just a null hypothesis. It should be noted that this problem does not occur in Borers system, where the matrix verb and the secondary predicate are combined to form a complex predicate, which does not have to involve causative meaning. That being said, again the explicit mechanism of the composition of the complex predicate is required, so that we can know how the causative interpretation is derived, and under what circumstances this interpretation does not occur.

Now, we are in a dilemma: in the event decomposition approach, especially the DM based studies, the relationship between the arguments and the predicate is not a problem, as each argument is licensed by a functional head, but the syntactic encoding of event decomposition is problematic, considering that the structure does not encode two sub-events, as is shown by examples in (6). And the possible lack of causative interpretation also challenges the postulation of a CAUSE head in the syntactic structure of resultatives. If we take Borers assumption, the sub-event problem is avoided, as only a single event with a single predicate (the complex predicate) is encoded in the structure, but then we have to explain what mechanism dictates that the secondary predicate should be predicated of the object DP. Also the vagueness of the composition of the complex predicate should be avoided, so that the lack of causative interpretation in some causatives can be explicitly explained.

In this paper, we will show that the issues of the function of event predicates, the syntactic encoding of event structure, and the causative interpretation need to be further addressed, and English resultatives will be the focus of our research, which provide a suitable construction to explore the three essen-

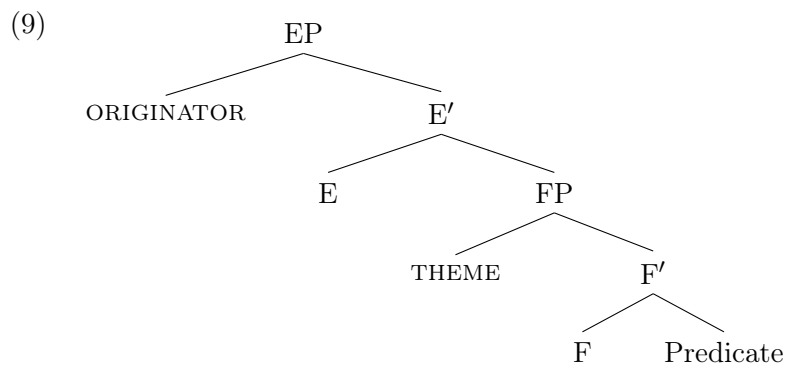
tial issues in the syntax-semantics interface study of events. Our research will show that Borers XS system is on the right track, but in this system we need a more explicit function of predicates, and an additional mechanism responsible for the source of the causative interpretation, with which, the potential problems involved in the study of resultatives will disappear.

The rest of this paper is organised as follows. In Section 2, we introduce the basic points of Borers XS model, and provide a further development of the function of predicates in this model. Based on the framework in Section 2, Section 3 provides an account of the issues of English resultatives, including the thematic relationship between the arguments and the predicates, the syntactic encoding of the event structure of resultatives, and the source of direct causation. Section 4 presents a brief conclusion.

2 THE THEORETICAL FRAMEWORK

2.1 *The XS model*

This paper adopts the XS model developed by Borer (2005a,b, 2013), who, following a Davidsonian approach (cf. Davidson 1967, 1980; Parsons 1990; Higginbotham 1985, 1998), assumes that sentences are expressions of events. The XS model assumes the event argument is encoded in the syntax, and there is a functional structure, the Event Phrase (EP), with an event node quantifying over a predicate phrase, which establishes a mapping from the predicate to event (Borer 2005b: 82). Abstracting away the technical details, the syntactic structure of EP is as follows:



The above syntactic structure mainly follows Borers assumption, with some simplifications for our current purpose. The interpretation of both the argument(s) and the predicate in an event are determined by the functional structure: the DP merged in [Spec EP] is the ORIGINATOR, the DP in [Spec FP] is the THEME and the lexical item selected to merge in the predicate position (the complement of F) takes the role of an event predicate. A special word is

needed here for the FP layer. In Borers system, if the event is telic, the FP layer would instead be an Asp(ect)P layer, with the [Telic] feature specified on the Asp head. If the event is atelic, an F^sP would be projected, and the non-originator participant of the event will be merged in the specifier position of F^sP. Since telicity will not be a focus of this paper, for convenience, we only put FP in our structure, covering both AspP and F^sP. The important point for our current purpose is that the non-originator participant, a THEME⁶ in the traditional sense, is merged in the [Spec FP] position. The predicate will move higher to get its verbal category, so as to be selected by T. Borer does not specify where the predicate should move, but it is certain that the landing site is higher than FP and lower than TP. We assume that the predicate would firstly move to E to be a verbal predicate, where it agrees with T. There is also a layer of TP in Borers structure, which, again, is not presented here. For a detailed analysis of the syntactic structure of EP, please refer to Borer (2005b: 95-120).

2.2 *The function of the event predicate*

An important theme of the XS model is that the projectionalist approach to argument structure is rejected: arguments are not projected by verbs; an argument gets its interpretation due to its syntactic position in the functional structure EP. The verb is taken as the event predicate only when it is inserted in the right position, i.e. the complement position of F. Its function, according to Borer, is not to assign theta roles, but to provide its conceptual meaning or content, in the sense of Ramchand (2008) and Borer (2013), to modify the functional structure. As long as the content of the predicates and the DPs are compatible with the structure, they can be selected.

While sticking to the spirit of XS model that the content of a predicate does not include any syntactical information, such as theta assignment rules, we assume that the content still plays a role in syntactic derivation. We first reinterpret what Borer means by modify and compatible as follows: in order for the event information derived from the syntax to be interpretable at the interface, in particular, to the conceptual-intentional (C-I) interface, the content of the predicate should be compatible with the interpretation provided by the syntax. For example, if DP₁ is merged in [Spec EP] and DP₂ in [Spec FP], the functional structure of EP would provide an interpretation that there

⁶ In Borers (2005a, b) system, the DP in the position of [Spec FP] is either subject of quantity in a telic event, or default participant in an atelic event, both are covered by the THEME argument in the traditional sense. A detailed analysis of the nature of this argument does not concern the issues in this paper, so to avoid confusion, we use the traditional term THEME just for the sake of convenience.

is an event such that it is originated by DP_1 , with DP_2 as its THEME. To guarantee the interpretability to the C-I systems, or, put it in another way, to make sure that this interpretation is accessible to real world knowledge, the content of the predicate should be compatible with this interpretation. For example, the predicate *jump* will not be legitimate in this case, because the action of *jumping* normally involves only an ORIGINATOR, without an additional THEME⁷. What is needed in the syntactic theory is whether this kind of function of the predicate is assimilated into syntactic derivation.

According to Chomsky (2001, 2004, 2012), the result of the derivation of a sentence is transferred to a pair of $\langle \text{PHON}, \text{SEM} \rangle$, with the sensimotor systems accessing PHON (phonological component) and conceptual-intentional systems accessing SEM (semantic component). The derivation converges if both interface conditions are satisfied. What concerns us is the C-I interface. When the SEM is taken as the input of C-I interface, the content of the lexical items will play a role. We assume that SEM is the combination of the interpretation provided by the functional structure and the content provided by the lexical items. According to Chomsky (2012: 540), SEM has to satisfy the C-I interface condition; otherwise, the derivation will crash. Among others, one possibility of dissatisfying the C-I interface condition, we assume, is that SEM cannot be generated. This happens if the interpretation generated by the functional structure is not compatible with the content of the lexical items, especially the predicate in our case. For example, if the functional EP structure derives the information that the event is originated, but the content of the predicate is incompatible with this information, then the formation of SEM will be blocked. The consequence is that, without SEM, there is not input for C-I interface, and thus the interface condition cannot be met, which naturally results in the crashing of this sentence.

This hypothesis is fully in line with the phase theory (cf. Chomsky 2001). The *vP* phrase that presents the event information is taken as a phase in Minimalism. Dispensing with *vP* phrase, we assume EP in the XS model is a phase, which will derive the SEM to be accessed by C-I interface. When the derivation of EP is completed, its derivation is mapped onto SEM to be accessed by C-I interface. If the incompatibility between the content of the predicate and interpretation derived by EP occurs, then C-I interface will have no input to access, which means that the further derivation of a higher

⁷ We are aware that *jump* can be followed by a DP in examples like John jumped the bridge meaning John jumped over the bridge. We assume that this DP is not merged in the [Spec FP] position, and thus does not get the interpretation of THEME. One explanation for such examples is that this type of DP is in fact a PP involving a covert preposition (or abstract clitic in the sense of Keyser & Roeper 1992), which further enriches the content of the predicate, i.e. the matrix V.

phase will be blocked, leading to the crashing of the derivation of the whole sentence. Our analysis thus explicitly claims that the content of the lexical items is not involved only after the derivation of a whole sentence is completed, contra to the later insertion operation in DM, but is inserted in the EP phase. This is just in line with Chomsky (2012: 542), who explicitly assumes that the computation maps LA (lexical items) to <PHON, SEM> piece-by-piece cyclically⁸.

We can thus summarise the function of the content of event predicates in syntactic derivation as follows:

- (10) **SEM of EP phase = EP interpretation + CONTENT**
The general function of an event predicate in syntactic derivation:
- a. The predicate only provides content, which does not contain any information concerning syntactic
 - b. The interpretation derived from EP should be compatible with the predicates content. The incompatibility leads to the failure of deriving SEM of the EP phase, and the derivation will crash.
- (11) **The relationship between event arguments and event predicates**
- An event participant X is legitimate only if it is licensed by a predicate.
 - A predicate should license at least one event participant.
 - The definition of “**license**”: an argument X of an event *e* is licensed by a predicate *P* if and only if the interpretation of X derived from EP structure is compatible with the content of the event predicate.

It should be noted that license in our framework is not a grammatical function, in that we do not assume the predicate takes theta features or projects theta roles. As we have put it above, we agree with Borer that arguments get their interpretations from the functional structure EP, and the event predicate only has to make sure that this interpretation provided by the functional structure, i.e. by the syntax, is interpretable at the interface.

⁸ We do not address the issue of spell-out here. It is possible that the lexical predicate is spelt out in the terminal node, with both tense and phi features all being realised. This is in theory plausible, considering that the predicate will move to the E (roughly the same with V-to-v movement), which is the head of the phase, which can be probed in the further derivation. The spelt-out of the lexical items is in controversy in current study of syntax. For relevant assumptions, please refer to Halle & Marantz (1993), Embick & Noyer (2007), Svenonius (2012), among others.

3 ACCOUNTING FOR RESULTATIVES

3.1 *The formation of the complex predicates*

Following the line we have developed so far, there is in effect no constraint to rule out the possibility of merging more than one predicate in Fs complement position, and we assume that in reality, there is the case when at least two predicates are inserted, which form a complex predicate. Based on the function of function of predicate postulated in (11), the formation of this type of complex predicates has to follow the following constraint:

(12) COMPLEX PREDICATE FORMATION CONSTRAINT:

In a complex predicate chunk consisting of two predicates P_1 and P_2 , both P_1 and P_2 should license at least one event participant.

The above constraint, at the first sight, is rather dubious. However, this is not just a rule based on no ground. Firstly we have shown in the last section that the central function of an event predicate is to license an event argument. Secondly, following Chomsky (2000), especially in the sense of the principle of economy, there should be a reason for a syntactic operation. Therefore, the selection of a predicative primitive should have a reason, and the reason, we assume, is to license the event participant.

Also an additional word for the term **complex predicate** is needed. The formation mechanism we postulated above indicates that this term is distinguished from the one in Neeleman & van de Koot (2002), whereby a complex predicate has a single theta grid derived from the integration of the theta grids of the primitive atomic predicates. In our system, the complex predicate is not a single unit, since the two predicates play their roles separately: each has to license at least one event argument. Therefore, we do not need to resort to any additional rule that integrates the theta-grids of the two predicates.

It seems that the constraint of complex predicate formation postulated here is similar to Argument-Per-Subevent Condition (Rappaport Hovav & Levin 2001), based on Rappaport Hovav & Levin (1998: 112-13), Grimshaw & Vikner (1993:144), van Hout (1996:201):

(13) ARGUMENT-PER-SUBEVENT CONDITION:

There must be at least one argument XP in the syntax persubevent in the event structure. (Rappaport Hovav & Levin 2001)

Both this condition and the complex predicate formation constraint in (12) relate one argument to one predicate—a very similar result. But the theoretical consequence is different. The Argument-Per-Subevent-Condition is based on the complex event template, which is a semantic representation of

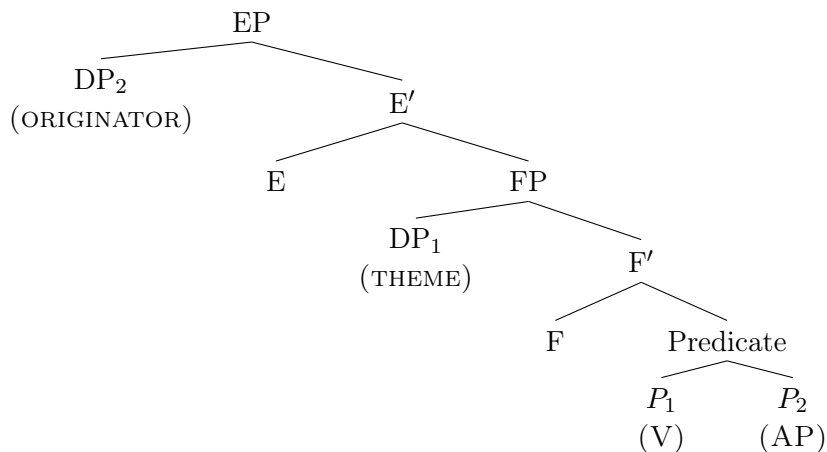
event decomposition. When this decomposition of the event is mapped onto syntax, it cannot avoid the problems we have introduced in Section 1: the sub-event cannot be separately modified by the manner adjunct, and the causative interpretation is not always attested. In our analysis, the constraint in (12) does not require a complex event, but is concerned with the two predicates in a single event, and thus potentially can avoid the two problems, which we will explicate further in 3.2.

3.2 The syntactic derivation of resultatives

We take Borers (2005) position that a resultative only involves a single event (thus a single EP structure). With our development of the function of event predicates and the complex predicate formation constraint, we can provide the full picture of the syntactic derivation of resultatives, which can avoid the remaining problems in Borers analysis of resultatives.

We assume that the resultative construction is just an instantiation of the structure with a complex predicate in the sense of (12), consisting of two atomic predicates: the matrix V and the secondary predicate, an AP or PP⁹. The derivation of resultatives is as follows:

(14) a. **The derivation of resultatives:**



b. **Semantics:**

$$\exists e.V(e)\&AP(e)\&THEME(DP_1, e)\&ORIGINATOR(DP_2, e)$$

A lot has to be explained about the above structure. DP₂ is interpreted as the ORIGINATOR, and DP₁ as THEME, of the event, because of their merging positions, and such interpretations have to be accessible at the interface, when

⁹ In this paper, we only take the resultative AP for discussion, assuming that resultative PPs have the same syntactic status.

the content of the predicates play a role, following the constraint in (11). One assumption we have is that DP_2 , the ORIGINATOR, has to be licensed by P_1 (V), while DP_1 , the THEME, should be licensed by P_2 (AP). But this seems to be a dubious stipulation, considering that the system we have developed so far does not provide any constraint to dictate which argument should be licensed by which predicate. However, this assumption, as is shown in (15), is a natural result.

(15) THREE DERIVATIONS OF RESULTATIVES:

Derivation A DP_1 (THEME) is only licensed by the verb. In the further derivation, the ORIGINATOR is merged. Since the content of AP cannot license an ORIGINATOR, this argument is still licensed by V. Because the event predicate AP does not license anything, considering (12), this derivation will crash.

Derivation B DP_1 is only licensed by AP. In the further derivation, the ORIGINATOR is merged, whose interpretation has to be licensed by V. The condition in (12) is met, and the derivation converges.

Derivation C DP_1 is licensed by AP and V simultaneously. In the further derivation, the ORIGINATOR is merged, which has to be licensed by V. The condition in (12) is still met, and the derivation converges.

Derivation A indicates that there is no possibility that the direct object (THEME) is not licensed by the secondary predicate, thus correctly predicting DOR. A potential problem is that in Derivation C, our system predicts that in some cases, an argument might be licensed twice, by two different predicates. This in fact is fully compatible with our assumptions. As we have explained in the above section, license is not a grammatical function in the traditional sense, as the arguments do not get their interpretations from the predicates projection, but from the functional structure EP. By licensing, we only mean that the content of the predicate ensures that the interpretation derived from the structure is interpretable at the interface, while how many times an argument is licensed, or by how many predicates it can be licensed, is not relevant here. Therefore, we do *not* have to follow the Theta Criterion which dictates that an argument can only be assigned a role once. While in most cases, an argument is licensed once only as often there is only one event predicate in the sentence, some particular phenomena might occur, as long as the interpretation at the interface level is guaranteed, other things being equal. Derivation C in (15) is just an exemplification of this case.

In fact, the data confirms our derivation, as examples of Derivation B and C are both widely attested:

- (16) a. John ran his NIKE threadbare.
 b. John hammered the metal flat.

(16a) is an example of Derivation B: the ORIGINATOR *John* is licensed by the verb *run*, and the THEME *his NIKE* is licensed by *threadbare*. The content of *run* makes the interpretation of ORIGINATOR, and the content of *threadbare*, makes the interpretation of THEME, both accessible at the interface. This then explicitly accounts for the reason why an intransitive verb can be followed with a direct object in resultatives: this is because the object DP, being a THEME in EP, is licensed by the secondary predicate. Without this secondary predicate, this DP will never be licensed, because the content of the intransitive verb cannot make this THEME interpretation interpretable at the interface.

(16b) exemplifies Derivation C. Recall, the licensing condition only requires that in our example, the THEME interpretation of *the metal*, derived from syntax, is interpretable at the interface. If *the metal* is licensed by both *hammer* and *flat*, it means that it is on the one hand the THEME of the hammering action, and on the other hand is the THEME of the flat state. Since such interpretation is fully accessible, there is no reason to reject the multiple licensing of the THEME, as long as other syntactic constraints are well followed. As both the data, and the theory-internal mechanism, allow for Derivation C, we can say that our system is likely to be on the right track.

What further strengthens our analysis is that the mechanism we have developed so far can predict that even for the example of (16b), the relationship between the direct object and the secondary predicate is optional. For example, although *the metal* is often taken as the THEME of the hammering action, it does not have to. Consider this scenario: if there is a machine X, which can make the metal flat. And X has to be charged by hammering it. Then, John kept hammering this machine, while at the same time, the machine began to work, making the metal flat. As long as there is no temporal gap between John's hammering and the metals becoming flat, we can still say John hammered the metal flat. But in this scenario, *the metal* is only licensed by *flat*, not by *hammer*. This scenario is fully compatible with our analysis. Note the constraints in (11) and (12) only require that the arguments be licensed, and each predicate should license at least one argument. This means that while the constraints allow for the further licensing of the THEME by V, this licensing is not obligatory, as this sentence can still be the result of Derivation B. If we dispense the constraint in (12) and postulate an extra rule that integrate the two predicates into a single predicate, it will be difficult for such a rule

to explain the two interpretations of (16b). In our analysis, the optional relationship between the object and the transitive verb in sentences like (16b) is not accounted for by any extra rule, but on the function of predicates in general, which, when combined with the syntactic derivation, naturally gives rise to the expected interpretations.

Without postulating any extra rules, our analysis also provides a natural account for the resultatives with an transitive verb whose normal object is not involved:

(17) John sang his throat hoarse.

The direct object in (17) is not interpreted as the THEME of the action denoted by the transitive verb, which is normally not possible in the non-resultative constructions. Again, this is a natural consequence of the derivation provided by our framework. In the derivation, *his throat*, merged in [Spec FP], gets its interpretation as the THEME of the event, and this is licensed by the event predicate *hoarse*. In this case, it does not matter that the other predicate *sing* cannot license this THEME, because the constraint in (11) only requires that the argument should be licensed by the event predicate. The ORIGINATOR *John*, is licensed by the verb *sing* in the further derivation. Thus, on the one hand, both the arguments are licensed, and on the other, both the predicates play the role of licensing at least one argument. Other things being equal, this derivation will converge, fully in line with the empirical data.

3.3 Direct causation in resultatives

The basic property of direct causation in resultatives is that in a causal chain between an event and a state, there are no intermediate causes (Bittner 1999; Kratzer 2004) between the causing event and the caused result; in terms of temporal relationship, there is no temporal gap between the causing event and the caused event. This distinguishes resultatives from constructions involving cause and make, where the causative relationship is indirect, as it allows for very long causal chains connecting the mentioned cause to the mentioned effect (Kratzer 2004):

(18) John made Mary sad this morning.

In (18), it is possible to have the scenario in which John did something yesterday, which caused Mary to be sad this morning. That is, a temporal gap might be involved in between the causing action and the resultative state. However, in resultatives, this scenario is impossible. In (16b), it is impossible to have the temporal gap between Johns hammering action and the metals becoming flat.

The account of the interpretation of direct causation should not only explicate the source of this interpretation, but also explain why in some cases, causative interpretation is not involved, as is shown in (8). In most of the studies on resultatives, the common assumption is that direct causation is derived from the narrow syntax, the problems of which are presented in Section 1. In the current analysis, we do not resort to the computation of the narrow syntax, but assume that the interpretation of direct causation is the result of the real world knowledge inference, forced by the interface condition. We will firstly outline the mechanism of the the real world knowledge inference in 3.3.1 and then apply it in the analysis of resultatives in 3.3.2.

3.3.1 *The interaction between SEM and real world knowledge*

A central claim of Minimalism (cf. Chomsky 2000, 2001) is that humans linguistic faculty is an optimal design for the satisfaction of interface conditions. This means that the representations generated by syntactic computation should be accessible to the general cognitive systems, so that other systems of brain/mind can read the expression generated by human language faculty and use them as instruction for thought and action (Chomsky 2000). Following this assumption, we can postulate a general Interface Constraint: The C-I interface condition requires that the semantic interpretation (SEM) derived from syntactic computation should be accessible to humans real world knowledge.

The General Interface Constraint dictates that the semantics to be processed by humans systems of general thoughts should be based on the SEM provided by syntactic derivation. On the other hand, it cannot reject the possibility that with the pressure to provide accessible interpretation to the C-I interface, SEM might be enriched.

(19) ENRICHMENT OF SEM VIA INFERENCE OF REAL WORLD KNOWLEDGE:

Due to the pressure of the General Interface Constraint, the SEM generated by syntactic derivation might be enriched by general cognitive principles so as to be accessible to humans real world knowledge.

The enrichment of SEM is a natural consequence of the interface condition. The mechanism of syntactic derivation is internalised as elements of humans language faculty, which is blind to real world knowledge stored in humans C-I systems, but the interface condition requires that the semantics blindly derived by language faculty has to be accessible to the C-I interface. Logically speaking, there is a possibility that the semantics derived by language faculty is not immediately legitimate to serve as the input of C-I interface. If this happens, the semantics derived by syntax might be enriched into a piece of

accessible interpretation, on condition that there is an inference mechanism that can realise this enrichment.

3.3.2 *Deriving direct causation from inference*

Recall, the semantics of resultatives derived from the syntactic computation is as follows:

- (20) $\exists e.V(e)\&AP(e)\&THEME(DP_1, e)\&ORIGINATOR(DP_2, e)$
 which means: There is a single event e in which the DP_2 argument is the **ORIGINATOR** of the action denoted by V and DP_1 argument is the **THEME** of the state denoted by AP .

Since both V and AP are the predicates of the same event, which is originated by the DP_2 argument in the [Spec EP] position, it means that the state denoted by AP is part of the event originated by DP_2 . Thus, the state either came into being simultaneously with the action, or immediately after the action without intervening temporal gap; otherwise, it will not be bound in the existential closure of e . The semantics of resultatives we can read off from the syntactic derivation is as follows:

- (21) SEMANTICS OF RESULTATIVES DERIVED FROM SYNTAX:
 In a single event e , an action a is originated by the entity denoted by DP_2 and meanwhile, or immediately after this action, a state s with the entity denoted by DP_2 as its **THEME**, comes into being.

We assume that the semantics in (21) often does not make sense to the C-I systems. To make it accessible to C-I systems, a semantic enrichment is derived from real world knowledge inference, following a cognitive principle in (22) :

- (22) Let \wedge be the symbol denoting the temporal relationship between a and s in e , represented in (21), given $a \wedge s$, assume $\wedge = \text{CAUSE}$.

That is, the language user will automatically assume that s is caused by a . Since a and s are involved in the same temporal scope, i.e. the temporal scope of the single event e , this causation is direct. It should be noted that the real world knowledge inference is not just a stipulation to describe the data, but is derived in a restrictive way. Firstly, as we have put in (19), it is reasonable to assume that the semantics provided by the syntax needs further enrichment to provide accessible interpretation at the interface, an assumption fully in line with the spirit of Minimalism. Secondly, based on the semantics in (21), a causative link is the most accessible inference to our real world knowledge.

The semantic enrichment is not obligatory considering that it is not the result of syntactic derivation, but only takes place when the semantics derived by syntax does not make sense to the C-I systems, i.e. humans real world knowledge. We can thus predict that if there is explicit context within which the semantics in (21) already makes sense to C-I systems, then this enrichment is not needed. This prediction is confirmed by the examples in (8), repeated in (23).

- (23) a. Reluctant to let him go, the audience clapped the singer off the state.
 b. At the opening of the new Parliament building, the crowd cheered the huge gates open. Borer (2005b: 225)

We assume that these examples are also resultatives. Following the analysis we have developed so far, they have the following semantic denotations respectively, which are in line with the interpretations of these sentences.

- (24) a. $\exists e. \text{CLAP}(e) \& \text{OFF-THE-STAGE}(e) \& \text{THEME}(\text{THE-SINGER}, e)$
 $\& \text{ORIGINATOR}(\text{THE-AUDIENCE}, e)$
 b. $\exists e. \text{CHEER}(e) \& \text{OPEN}(e) \& \text{THEME}(\text{THE-HUGE-GATES}, e)$
 $\& \text{ORIGINATOR}(\text{THE-CROWD}, e)$

In both examples, the semantics derived from the syntactic computation already makes sense in the contexts, and naturally, the causative interpretation derived from semantic enrichment is not required. All the other approaches that reduce causative interpretation to the CAUSE head, as we have introduced in Section 1, cannot provide a proper account of these examples.

4 CONCLUSION

With the analysis of resultatives, this paper presents an empirical argument to address the three issues in the syntax of events: the function of the event predicate, the syntactic encoding of the event structure and the source of the causative interpretation. While sticking to the framework of the constructivist approach, especially Borers XS model, we argue that the content of the predicate still plays a role in syntactic derivation, as the compatibility between the content and the interpretation derived in the phase that derives the event information (*v*P phase in the traditional sense, and EP phase in this paper) determines whether legitimate input (SEM) can be derived to satisfy the C-I interface condition. In particular, we have shown that each event predicate should license at least an event participant such that the interpretation of this participant derived from the functional structure should be compatible with

the content of the predicate. In terms of the syntactic encoding of the event structure, we reject the traditional operation which maps a complex event onto syntax. These two assumptions together provide a systematic account of the thematic relationship in resultatives, including DOR and optional argument sharing. Based on the interface condition requirement, we postulate that causative interpretation is the result of semantic enrichment of the interpretation derived from syntax, so as to guarantee the accessible interpretation to the C-I systems. This enrichment, although based on the semantics from syntactic computation, is the result of inference following a syntax-external cognitive principle, thus making the lack of causative interpretation in some resultatives a natural result.

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