Nominals, Polysemy and Co-predication

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Abstract[1]

In this paper, we examine the event/result meaning contrast displayed by Italian nominals derived from creation and redescription verbs, such as *costruzione* 'construction, building' and *traduzione* 'translation'. The goal of our research is twofold. First, we intend to verify whether the intriguing pattern of polysemy exhibited by these nominals may be analyzed as a special case of *complex type*, with the two constituents of the type analyzed as PROCESS and RESULT-STATE, as proposed in Pustejovsky (1995). Second, we want to clarify what factors might be causing the difficulty in co-predication (i.e. simultaneous access to both subtypes, commonly regarded as the test for complex types) that these nominal typically exhibit, as reported in the literature. Results of this study can be summarized as follows: the RESULT-STATE interpretation (i.e. *construction* as 'the state of being constructed') appears not to be generally accessible to these nominals, and co-predication appears to be licensed only under specific syntactic and semantic conditions. We claim that both behaviors follow from the inherent properties of the event associated with these nominals, which encode a peculiar temporal relation between the subevents. Based on this insight, we propose a revised modelling of the lexical representation of creation and redescription nominals within the Generative Lexicon (GL) framework, which is more in line with empirical evidence. The results of our study are relevant for better understanding the phenomenon of lexical polysemy, and the interplay between aspectual and lexical properties of Action Nominals.

1 Introduction

This paper deals with the event/result polysemy pattern displayed by *Nomina Actionis* or Action Nominals (henceforth ANs) derived from creation or redescription verbs, such as It. *costruzione* 'construction / building' and *traduzione* 'translation' in (1).

(1) a. La *costruzione* della diga fu lunga e laboriosa. (EVENT)
'The building of the dam was long and arduous.'

b. Presto saranno demolite molte *costruzioni*. (RESULT)
'Many buildings will be demolished soon.'

c. Ad oggi ho completato la *traduzione* del primo libro. (EVENT)
'So far, I have completed the translation of the first book.'

[1] The paper is the outcome of a joint discussion between the co-authors. For the specific concerns of the Italian Academy only, Elisabetta Ježek bears responsibility for sections 1, 2, 2.3, 3.3.2, 4 and 4.1 and Chiara Melloni for sections 2.1, 2.2, 3, 3.1, 3.2, 3.3, 3.3.1 and 5. An earlier version was published in the Proceedings of the 5th Workshop on Generative Approaches to the Lexicon (GL2009, Sept. 17-19, ILC-CNR, Pisa, Italy).

d. Desidero citare una *traduzione* di quel bellissimo testo. (RESULT)
'I wish to quote a translation of that wonderful text.'

The event/result meaning contrast displayed by these nouns has been the subject of several theoretical investigations, especially because of the challenging syntactic corollaries related to their semantic ambiguity (cf. Grimshaw 1990 and Alexiadou 2002, among others). Much less attention, however, has been paid to the phenomenon from a lexical-semantic perspective. Among others, Asher (1993) and Pustejovsky (1995) tackled this issue focusing on the syntactic and semantic structures of the base verbs, and pointing to different formal solutions.

Based on the achievements of previous works on polysemy (cf., a.o., Copestake and Briscoe 1995), the overall aim of this paper is twofold. First, we intend to verify whether the intriguing pattern of polysemy exhibited by these nominals may be analyzed as a special case of *complex type*, with the two constituents of the type analyzed as PROCESS and RESULT-STATE, as proposed in Pustejovsky (1995). Second, we want to clarify what factors might be causing the difficulty in co-predication (i.e. simultaneous access to both subtypes, commonly regarded as the test for complex types) that these nominal typically exhibit, as reported in the literature. Results of this study can be summarized as follows: the RESULT-STATE interpretation (i.e. *construction* as 'the state of being constructed') appears not to be generally accessible to these nominals, and co-predication appears to be licensed only under specific syntactic and semantic conditions. We claim that both behaviors follow from the inherent properties of the event associated with these nominals, which encode a peculiar temporal relation between the subevents. Based on this insight, we propose a revised modelling of the lexical representation of creation and redescription nominals within the Generative Lexicon (GL) model, which is more in line with empirical evidence. The results of our study are relevant for better understanding the phenomenon of lexical polysemy, and the interplay between aspectual and lexical properties of Action Nominals.

The structure of the paper is as follows. In section 2 we introduce the classification of complex types in GL theory, paying particular attention to those exhibiting polysemy between event and result readings (2.1). In section 2.2 we summarize the issues raised by this analysis and illustrate our theoretical claims, while in 2.3 we illustrate the methodology we adopted in collecting and examining the empirical data. In section 3 and 4 we give a unified account of the results of our investigation. We first propose a revised lexical representation for EVENT•RESULT-OBJECT nominals and then spell out the co-predications constraints observed in the data. In section 5 we draw our conclusions and locate the results of our study in a broader perspective.

2 Theoretical Framework

In our analysis of ANs' polysemy, we assume the GL model as our theoretical framework. Classic GL (Pustejovsky, 1995) proposes that the linguistic knowledge associated with a lexical item may be represented through four informational structures (in our study we will be mainly concerned with the last three).

- LEXICAL TYPING STRUCTURE: gives an explicit type for a word positioned within a type system for the language;
- ARGUMENT STRUCTURE: specifies the number and nature of the arguments to a predicate;

- EVENT STRUCTURE: defines the event type of the predicate and any sub-eventual structure it may have;
- QUALIA STRUCTURE: provides a structural differentiation of the predicative force for a lexical item.

The Argument Structure captures the participants in the event described by the predicate. GL introduces a distinction between three primitive argument types:

- TRUE ARGUMENT: syntactically realized argument of the lexical item ("Mary rented the *car"*);
- DEFAULT ARGUMENT: argument which participates in the logical expression in the Qualia, but which is not necessarily expressed syntactically ("John left (*the room*)");
- SHADOW ARGUMENT: argument which is semantically incorporated into the lexical item and can be expressed only by operations of subtyping ("Mary phoned John *with the phone/*with her new phone"*).

The Event Structure identifies the specific event type for a verb or phrase. The primitive event types posited in GL are:

- STATE: a single event, which is evaluated relative to no other event (*love*, *know*);
- PROCESS: a sequence of events identifying the same semantic expression (*run*, *push*);
- TRANSITION: an event identifying a semantic expression, which is evaluated relating it to its opposition (*open*, *build*).

Qualia Structure consists in four distinct relations, each capturing an essential aspect of the meaning of a word:

- FORMAL QUALE: specifies the basic category which distinguishes the object denoted by the word within a larger domain (a house is a kind of *building*);
- CONSTITUTIVE QUALE: defines the relation between the object and its constituent parts (a house has *rooms*, *door*, *window* etc.);
- TELIC QUALE: defines the purpose or function of the object, if there is one (a house is for *living_in*);
- AGENTIVE QUALE: specifies the factors involved in the object's origin or its "coming into being" (a house is *built*).

The different meaning dimensions listed above can be represented as a set of features. GL lexical representations are grounded in terms of typed feature structures. The feature representation as shown below in fig. 1 gives the basic template of argument and event variables, and the specification of the qualia structure for a lexical item α.

$$\begin{bmatrix} \alpha \\ \text{ARGSTR} = \begin{bmatrix} \text{ARG1} = x \\ \dots \end{bmatrix} \\ \text{EVENTSTR} = \begin{bmatrix} \text{E1} = e_1 \\ \dots \end{bmatrix} \\ \text{QUALIA} = \begin{bmatrix} \text{CONST} = \textbf{what } x \textbf{ is made of} \\ \text{FORMAL} = \textbf{what } x \textbf{ is} \\ \text{TELIC} = \textbf{function of } x \\ \text{AGENTIVE} = \textbf{how } x \textbf{ came into being} \end{bmatrix} \end{bmatrix}$$

Fig. 1 Lexical representation in GL

In GL, Qualia roles are used as a basic vocabulary to define the conceptual categories associated with lexical items (semantic types). Pustejovsky (2001) proposes a ranking of types distinguishing between natural and artifactual types, and then complex types, defined as follows.

- NATURAL TYPES: Concepts formed from the application of the FORMAL and/or CONSTITUTIVE qualia roles (e.g. *lion, rock, water*);
- ARTIFACTUAL TYPES: Concepts formed from the Naturals by adding the AGENTIVE or TELIC qualia roles: (e.g. *beer, knife, teacher*);
- COMPLEX TYPES: Concepts formed from the Naturals and Artifactuals by a product type between the entities, i.e., the dot, •. (e.g. *school, book, lunch*).

Complex types (or dot objects) are reifications of multiple types, bound by a coherent relation. For example, *book* is a complex type denoting both the informational context (2a) and the physical manifestation of that content (2b), bound by the relation *hold*. This can be informally expressed as follows: hold (informational content, physical object).

(2) a. È impossibile *riassumere* questo libro. (INFORMATIONAL CONTENT)
'It is impossible to summarize this book'

b. *Afferrò* il libro che gli stavo porgendo. (PHYSICAL OBJECT)
'He grabbed the book I was handing to him'

Complex types were introduced in GL to account for cases when a single word or phrase has the ability to appear in selected contexts that are contradictory in type specification, i.e. in co-predication constructions. For example, in (3) the two senses of *book* (physical object and informational content) are simultaneously accessed by applying two types of predicates to the same object (*portare con sé* 'carry', selecting for the physical aspect, and *tradurre* 'translate', selecting for the informational one):

(3) un libro da *portare con sé* e *tradurre* con calma.
'a book to carry and translate with ease'

In fig. 2 we report the proposed GL lexical representation for the complex type *book* (restricted to ArgStr and Qualia) using the feature structure formalism presented above. From this representation we can see that the polysemy in complex nominals such as *book* is encoded directly into the type of the object. Particularly, the Formal quale defines how the two arguments (information and physical object) are related to each other (hold).

$$\begin{bmatrix} \textbf{book} & \\ \text{ARGSTR} = & \begin{bmatrix} \text{ARG1} = \texttt{y:information} \\ \text{ARG2} = \texttt{x:phys\_obj} \end{bmatrix} \\ \text{QUALIA} = & \begin{bmatrix} \text{FORM} = \texttt{hold(x,y)} \\ \text{TELIC} = \texttt{read(e,w,x.y)} \\ \text{AGENT} = \texttt{write(e',v,x.y)} \end{bmatrix} \end{bmatrix}$$

Fig. 2. *book*

The type of polysemy exhibited by words associated with complex types is referred to as *inherent polysemy* in GL.

Having defined the notion of complex type generally, in the next section we turn to the analysis of complex types represented by ANs.

2. 1 Complex Types for Action Nominals

In GL theory, nominals displaying the event/result meaning contrast are classified as complex types. That is, it is assumed that the event/result senses of ANs are an instance of *lexically* specified (or inherent) polysemy, i.e. an ambiguity available by virtue of the semantics inherent in the noun itself. The compositional operation which is assumed to be at play in the disambiguation of dot objects in context is called *Dot-Exploitation*[2] (*Dot Object Subtyping* in Pustejovsky 1995). Dot exploitation can be seen as a "light" form of coercion. It consists of exploiting only one aspect of a dot type. For example, in (1a) (that we repeat in 4 for convenience), the adjectives *lunga* and *laboriosa* exploit the EVENT reading of *costruzione*, while in (b) the verb *demolire* exploits the RESULT one.

(4) a. La *costruzione* della diga fu lunga e laboriosa. (EVENT)
'The building of the dam was long and arduous'

b. Presto saranno demolite molte *costruzioni***.** (RESULT)
'Many buildings will be demolished soon'

Regarding the internal composition of AN's dot types, Pustejovsky (1995) proposes to analyse them as EVENT•EVENT or, more specifically, PROCESS•(RESULT-)STATE. In particular, the author claims that for *-ion* nominalizations in English, three interpretations are available, i.e. PROCESS, RESULT or PROCESS•RESULT, the latter given by the dot object itself. These interpretations are exemplified below (the examples are taken from Pustejovsky 1995, 170-171):

(5) a. John fell from the ladder during the *construction* of the roof frame. (PROCESS)
b. With the *construction* of the roof complete, John can start shingling. (RESULT STATE)
c. John's *construction* of the roof frame for the house was done yesterday.
(PROCESS•RESULT)

Moreover, according to the author, for nominalizations which are derived from verbs of creation (e.g. *building*, *construction*, etc.) the result interpretation may correspond either to the individual which is created as a result of the initial process (as in 6 below), or to the state itself (Pustejovsky 1995, 172).

(6) The *construction* is standing on the next street. (RESULT OBJECT)

The representation proposed for PROCESS•RESULT nominals in GL differs from that proposed for PHYS•INFO complex types such as *book*. This can be seen if we compare the representation in fig. 2 with that in fig 3: while in fig. 2 the entire dot object is coded in the Formal quale of the lexical structure, in fig. 3 the components of the dot type are split between the Formal and the Agentive quale.

[2] For formal details, cf. Asher and Pustejovsky (2006).

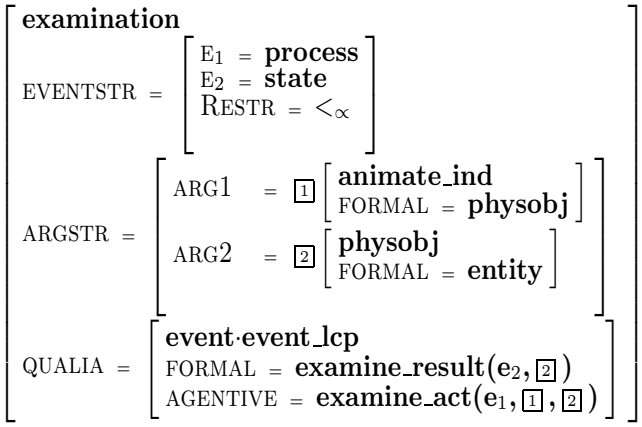


Fig. 3 *examination*

2.2 Discussion

The research on nominal polysemy patterns, conducted adopting the notion of complex type, has brought about several intriguing puzzles about this class of alleged dots.

A first issue concerns the nature of the types making up the complex. While Pustejovsky argues in favour of a PROCESS•(RESULT-)STATE polysemy extended to creation nominals, other studies (cf., in particular, Apresjan 1974, Bierwisch 1991, Asher 1993, Asher and Denis 2005, Osswald 2005, Bisetto and Melloni 2007, Melloni 2007, Ježek 2008) introduce, besides events and states, other sortal types for the result reading, such as CREATED OBJECT or RESULT OBJECT.

A second issue concerns co-predication. Co-predication is generally considered as a reliable diagnostic for identifying dot types: since they are type bundles, dot objects should license predications over either of the two (or more) constituent types. However, it appears that only certain ANs can enter co-predicative contexts and they can do it only at specific syntactic and semantic conditions, including temporal disjunction between the types, omission of the internal argument and insertion of a relative pronoun (cf. Jacquey 2001 for a thorough analysis of French ANs in co-predication contexts). Consequently, the dot nature of ANs is not uncontroversially accepted, and other scholars have pursued alternative research lines (cf. Asher and Denis 2005, proposing that creation ANs are an instance of disjunctive types / homonymy, and Brandtner and von Heusinger 2010, defending the meaning transfer hypothesis in the line of Nunberg 1995).

In the present study, we tackle both the contentious issues raised above. Particularly, we show that the (RESULT-)STATE analysis proposed in GL for the result reading of nominals derived from creation verbs is not fully supported by empirical data, and we argue that this is expected because the proposed analysis of the event structure of these nominals does not take into account the distinction between standard causatives and accomplishments taking an incremental theme. The latter class, in fact, includes traditional creation and redescription verbs, which, like consumption verbs and other classes, encode a peculiar temporal relation between the subevents. We thus argue (see the discussion below) that it is the verb event structure that straightforwardly accounts for the polysemy pattern of creation and redescription nominals, which, as the data will show, are in fact unable to refer to a result state.

Furthermore, we argue that the inherent structure of the event associated with these nominals is responsible also for the constraints on the simultaneous activation of the event and the

result reading in co-predication structures. Particularly, we claim that the causal asymmetry existing between the event and the result type, according to which the performance of the event is the precondition for the coming into existence of the result, licenses copredication with these nominals only at specific conditions.

Starting from an accurate analysis of the semantic and syntactic behaviour of these nominals as attested in the corpus, in the last part of this paper we will show that an analysis of this special case of polysemy, conducted along the lines sketched above, can explain the inaccessibility of the result-state reading as well as the attested troubles with co-predication.

2.3 **Methodology for Empirical Analysis**

In our empirical investigation, we examine selection contexts extracted from corpus data, where either one sense (EVENT or RESULT) or both senses (EVENT and RESULT) of deverbal nominals is/are instantiated[3]. In order to establish which sense(s) is/are activated in context, we pay attention to the selectional properties of the adjectival and verbal *collocates* of ANs, that following Rumshisky (2007) we call *selectors* (cf. also Ježek 2008). For example, in the expression in (4a) both *lunga* and *laboriosa* select a noun typed as EVENT (as shown by the fact that most of their collocates are temporal entities). Therefore, the sense of *costruzione* triggered in context is the EVENT sense, not the RESULT one. Conversely, in (4b), the predicate *demolire* selects a CONCRETE OBJECT and it is the RESULT sense that is exploited in context.

While in section 3.2. we mainly deal with data highlighting a single aspect of the complex sense of the ANs under discussion, in section 4, we focus on contexts in which both senses are simultaneously activated (*co-predication contexts*). In order to extract co-predication contexts, we use regular expressions based on Corpus Query Language (CQL), that retrieve the typical lexico-syntactic patterns in which co-predication may apply. Particularly, we extract contexts in which two selectors appear (either adjectival or verbal or both) and further isolate those that pick out different meanings of the same nominal. For example, to extract contexts containing two adjectival selectors as in (4a), we use various regular expressions, of which the simplest ones are given in (7) and (8), that retrieve all the contexts in which the noun *costruzione* is immediately followed by two adjacent adjectives connected by *e* 'and' (7) or *ma* 'but' (8):

(7) [lemma="costruzione"][tag="ADJ"][lemma="e"][tag="ADJ"]
(8) [lemma="costruzione"][tag="ADJ"][lemma="ma"][tag="ADJ"]

3 Empirical Findings and Theoretical Analysis

In this section, we present the results of our research, and put forth an explanation for some of the puzzles posed by the data. We first examine the actual contexts looking at the selectors that highlight the constituents of these complex types, and then challenge some of Pustejovsky's (1995) claims (3.1). Our explanation for the data calls into play event structure theory and is mainly grounded on Levin and Rappaport Hovav's work on verb semantics (1998, 1999, in particular), which is incorporated here in Pustejovsky's GL framework (3.2). A formal medelling of the ANs at stake is attempted in 3.3. Finally, in 4, we turn to the analy-

[3] Our dataset is extracted from the ITWaC corpus (Italian Web as Corpus – cf. Baroni and Kilgarriff 2006) using the Word Sketch Engine corpus query tool (Kilgarriff et al. 2004).

sis of co-predication contexts, discuss the constraints identified in our study and offer a possible interpretation based on the subeventual analysis proposed in 3.2.

3.1 Result State or Result Object?

In this section we intend to clarify whether the polysemy patterns displayed by ANs can in fact be reduced to the EVENT•(RESULT)STATE polysemy proposed in Pustejovsky (1995).
In general, our analysis confirms that the (RESULT-)STATE interpretation is available to several deverbal nominals. For example, both *isolamento* and *ostruzione* may express the process of isolation or obstruction (cf. 9a and 10a) and the STATE of being isolated or obstructed (9b-c and 10b):

(9) *isolamento* 'isolation'

a. Effettuare indagini per l'*isolamento* di virus e batteri. (EVENT)
'To conduct investigations for the isolation of viruses and bacteria'

b. L' *isolamento* geografico ha determinato la sopravvivenza di alcune specie. (STATE)
'The geographic isolation has determined the survival of some species'

(10) *ostruzione* 'obstruction'

a. Per evitare *l'ostruzione* del tubo i tubi stessi devono essere lavati. (EVENT)
'To prevent the obstruction of the pipes, pipes must be cleaned'

b. *L'ostruzione* può essere temporanea o permanente. (STATE)
'The obstruction may be temporary or permanent'

c. Questo test permette di capire esattamente dove si trova l'*ostruzione*. (RESULT-OBJECT)
'This test allows to understand exactly where the obstruction is'

Concerning *isolamento*, obviously it is not the process of being isolated which determines the survival of certain species in (9b) but their *state* of being isolated. A comparable analysis applies to *ostruzione*, with the difference that the example in (10c) shows that *ostruzione* may refer to an object, besides the event and state interpretation displayed in (10a/b) (the reader may have noticed that *ostruzione* in (10c) does not necessarily refer to a *result* object, that is, an object put into existence as the result of the corresponding event. See Melloni 2010 for an analysis of these cases).

The (result-)state interpretation, however, is generally not accessible to nominals obtained from verbs expressing events which put a new entity into existence. In other words, nominals such as *costruzione* 'construction' or *traduzione* 'translation', i.e. obtained from a creation and a re-description predicate respectively, are unable to refer to the resulting state of the event they encode. For example, *construction* or *translation* cannot refer to the state of being constructed or translated, nor can they denote the state of *existence* of the construction and translation respectively. Consider the sentence with *costruzione* below.

(11) #La costruzione del centro commerciale di via Verdi si è protratta per quasi dieci anni, poi hanno cominciato a demolirlo per far spazio ad un ampio parcheggio sotterraneo.

'The building of the mall in Verdi street has gone on for almost ten years, then they began demolishing it to make room for a large underground car park.'

The first predicate in (11) (*protrarsi* 'go on') unambiguously triggers the (uncompleted) process interpretation of *costruzione* even though the second proposition should make the nominal more compatible with a state (/existence) reading. Since a state reading of *costruzione* is not available, the sentence is semantically acceptable only under the interpretation by which an uncompleted building (the mall anaphorically resumed in the second part of the sentence) is undergoing demolition.

While the state reading is not available, creation and redescription nominals can instead refer to the concrete or abstract objects obtained by the associated event, as we can see from the example below:

(12) La *costruzione* […] venne bombardata dai giapponesi nel 1939.
'The construction was bombed by the Japanese in 1939.'

This is a polysemy pattern that is common to almost all creation nominals (e.g. *composizione* 'composition', *coniazione* 'coinage', *creazione* 'creation', *formazione* 'formation (/team)', *produzione* 'production', etc.) and redescription nominals (e.g. *citazione* 'quotation', *copiatura* 'copy', *falsificazione* 'falsification', *imitazione* 'imitation', *rappresentazione* 'representation', *registrazione* 'registration', *ricopiatura* '(fair) copy', *ricostruzione* 'reconstruction', *rifacimento* 'remake', *riproduzione* 're- production', *riscrittura* 're-writing', *trascrizione* 'transcription', etc.) On these grounds, we argue that the notion of result - for creation and re-description nominals at least - hinges primarily on the concept of abstract or physical object yielded by the corresponding event instead of the resulting state. We thus propose that the event/result polysemy exhibited by these nominals should be classified primarily as EVENT•(RESULT-)OBJECT, rather than PROCESS•(RESULT-)STATE.[4]

Since, as we have seen above (ex. 9/10), there are ANs (derived from causative verbs) that can refer to the process/event, to the result state and to the created object, the question we intend to address next is: what blocks the state interpretation for creation and re-description nominals like *construction* or *translation* and not for nominals like *obstruction*? We will address this issue in the next section.

3.2 An Event Structure Analysis of Creation/Redescription Verbs

The analysis of nominals polysemy we propose in this section takes into account the semantics of the verb which is the base of the nominalization process. Building on recent works on verb semantics, we suggest that Pustejovsky's (1995) analysis of event structure, which motivates the PROCESS•STATE polysemy of ANs such as *development* / *building*, does not capture the distinction between standard causatives and accomplishments taking an incremental theme. The latter class, in fact, includes traditional creation and redescription verbs, which encode a peculiar temporal relation in their event structure composition.

We thus argue that it is verb event structure which straightforwardly accounts for the polysemy patterns of creation and redescription nominals, which are in fact unable to refer to a result state. Let us elaborate on this point (for further explanation, cf. Melloni 2007 and Ježek and Melloni 2009).

[4] Although the present analysis mainly hinges on Italian data, we believe that a similar pattern of polysemy can be found in many other Indo-European languages, where event nominals share comparable morpho-syntactic and semantic patterns.

Verbs such as *costruire* or *tradurre* lexicalize a process targeting an end-point, and - with a quantized object - they can be defined as telic predicates at the VP level. According to Dowty's classification, therefore, they are accomplishments as well as *break*, *isolate*, *obstruct*, etc. However, finer-grained semantic analyses such as Levin & Rappaport Hovav (1999) argue in favour of a simple Event Structure (ES) for accomplishments taking incremental themes. While accomplishments are usually analyzed as causative verbs, hence amenable to a complex event analysis like the one in (13), cf. Rappaport Hovav & Levin (1998)[5], Levin & Rappaport Hovav (1999:213) argue that creation and re-description verbs differ from "regular" accomplishments inasmuch as they undergo a semantic process of EVENT Co-IDENTIFICATION at the ES level, initiated by the incrementality of the creation process.

(13) LCS of Causative Verbs
[[x ACT <*MANNER*>] CAUSE [BECOME [y <*STATE*>]]]

Co-identification of the constituent subevents in a complex event structure is defined as the relation that holds between subevents that are distinct in terms of conceptual structure but that can be represented as a single simple event in ES terms if the following conditions are met:

a. The subevents must have the same location and must necessarily be temporally dependent (where temporal co-dependence does not only mean 'shared temporal extent', but crucially means that the subevents *unfold at the same rate*).
b. One subevent must have a property that measures out that subevent in time, so that a change in value of the property reflects the temporal progress of the event. For events of creation, the relevant property is *the spatial extent of the created object*; this property is predicated of an entity that is necessarily a participant in both subevents.[6]

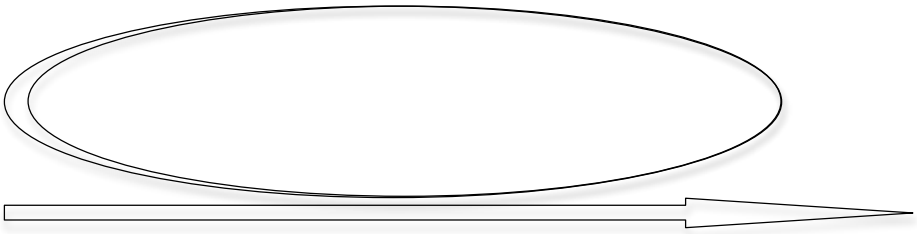
As for creation and re-description predicates such as *costruire* and *tradurre*, co-identification is instantiated by what is generally acknowledged as the incremental theme (Dowty 1991) and specifically by the property of the incremental theme of measuring out the extent of the event through its physical extension. In the case of creation verbs, the incrementality is realized as mapping of object onto event, i.e. as suggested by Krifka (1992): informally, the physical extension of the argument is mapped onto the temporal extension of the event. In the case of redescription predicates, the incrementality of the predicate (or its scalar nature, see note 6) is instantiated by the physical or informational extent of two objects: the object which is the source of the translation, and the object that comes into existence throughout the event.

It is worth noticing however that, in order to account for the flexible syntactic manifestation of incremental theme verbs, Levin & Rappaport Hovav equates this class with the aspectual class of process/activity verbs, which differ from standard accomplishments in several important respects, first of all, homogeneity (see Bach, 1986 on this topic). Moreover, in their analysis it is not easy to capture the relation holding between the subevents in the complex predicate, if any. It cannot really be a causative relation, as indicated in the LCS in (13), since, as it is well known, Cause implies precedence. That is, if Cause holds between a subevent P and a subevent S, then P precedes S. Intuitively, however, Cause is the very relation at stake in creation and redescription events: in order for a house/translation to exist, there must have been a building/translating process bringing it into existence. The building/translating process

[5] See, however, the distinction proposed in Van Valin (2005) between Accomplishments and Causative Accomplishments (Van Valin 2005:34).
[6] This proposal presupposes homomorphism between the temporal unfolding of the event and a scalar property or *degree* value. That is, different values along the scale of change map onto different portions of the event expressing the change (cf. Hay, Kennedy and Levin 1999).

is the sufficient condition for the house existence. Hence, we raise the question whether and how it is possible to combine Levin & Rappaport Hovav's considerations on incrementality and Event Structure with the temporal ordering of subevents implied in causal structures.

The hypothesis we pursue is that, given a causative structure, the two subevents composing it may or may not overlap. In the case of creation predicates, the causing event precedes the state subevent (corresponding in fact to a series of existence states) which is in complete overlap with the former, as schematically represented below:



$E1 <^{\circ} \propto E2$

Fig 4. Event Structure of creation/redescription verbs

In this analysis, however, E2 is not only co-extensive but is also temporally dependent on E1 because of the incrementality of the theme, as predicted in event co-identification theory (cf. point a, above).

The temporal constitution of these complex events can be captured in the GL theory of ES with the relation $<^{\circ}\propto$ holding between E1 and E2, which means precedence and overlap (in this respect we depart from Pustejovsky 1995, who proposes simple precedence $<^{\circ}$ for accomplishments such as *build* and reserve $<^{\circ}\propto$ for verbs like *move*).

The crucial point for the present analysis of nominals polysemy is that, in this view, since the causing process (E1) overlaps the state subevent (E2), there is no independent access to the BECOME subevent and to the resulting STATE either. Such inaccessibility to the state – we argue - is inherited by the nominal, which is therefore incapable of yielding a result state interpretation.

On the contrary, the result state interpretation is available to those nominals which are derived from causatives implying no temporal overlap and in which a certain (reversible/transitory) state is independently represented in the temporal ordering of the event, like in *isolate* (cf. data in 9).

3.3 Formal Modeling of ANs

In this section, we present a proposal of lexical representation for the complex types *costruzione* and *traduzione*, i.e., polysemous ANs derived from a creation and a re-description verb respectively. This proposal, which incorporates the considerations and empirical findings illustrated in the previous section, departs from Pustejovsky's representation of action nominals in the GL framework both in event structure and qualia structure representation.
We shall start from creation nominals and then turn to re-description nominals.

3.3.1 Creation Nominals

In fig. 5, we propose a GL-modeled lexical representation for *construction*.

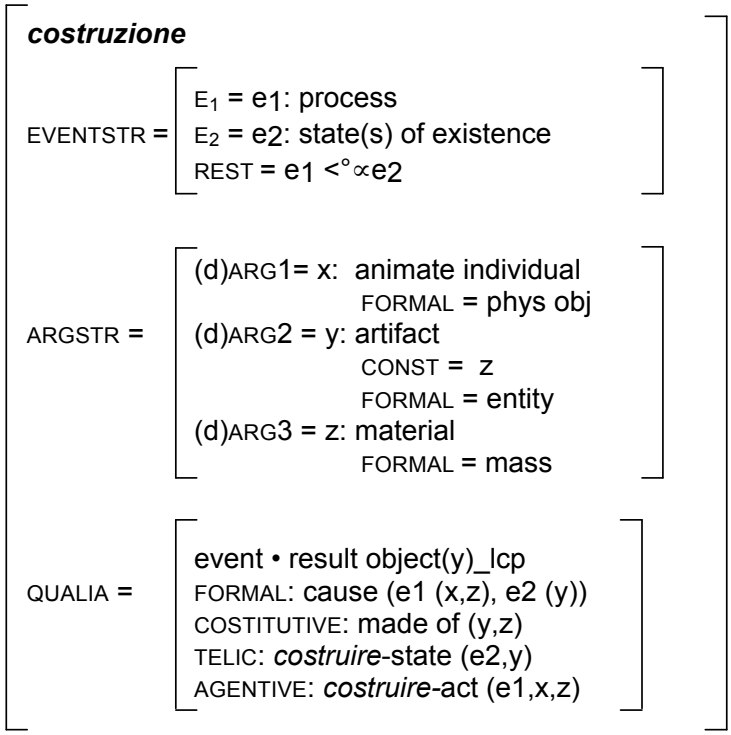


Fig. 5. *costruzione*

Our proposal is grounded on the assumption that event and argument structures of the base verb are inherited by the corresponding derived nominal (see Melloni 2006, 2007 and Ježek 2009 for proposals along these lines). The Event Structure of *costruzione*, thus, is a complex ES, since it contains a causing process and a (series of) state(s) connected by a temporal relation envisaging precedence and overlap (<°∝), as illustrated in section 3.2. Further, the Argument Structure of *costruire* contains three default arguments, namely the agent (d-ARG1), the artifact (the resulting object, d-ARG2) and the material out of which the artifact is created (d-ARG3). In the derivation process, the EVENT subtype preserves the base verb AS, while the RESULT subtype entirely "absorbs" (or semantically incorporates) d-ARG2, corresponding to the object position (y). The (un-)availability of the internal argument - at the semantic level - is set by *dot exploitation*, allowing predication over one of the two aspects in the complex type, hence defining the relevant type in the context.

As for Qualia Structure, our representation in fig. 5 is in line with the representation proposed in classic GL for standard dot-objects like *book* and *door*, but it crucially deviates from EVENT•EVENT dots like *examination* and *arrival* (cf. Pustejovsky 1995) not only in type composition (EVENT•RESULT OBJECT, instead of PROCESS•RESULT STATE), but also in Formal quale constitution. As we clarified in 2, classic dot-objects representation envisages a relational representation in the Formal Quale, consisting in a predicative structure defining the relation between the arguments / types in the complex (fig. 2), while PROCESS•RESULT nominals representation splits the types in the complex between the Agentive and the Formal qualia (cf. fig. 3 above). In our proposal in fig. 5 we, thus, adhere to the original interpretation of Formal quale and propose to encode in it the relation between the subtypes in the dot type.

Specifically, as for the noun *costruzione*, we propose that the predicate CAUSE, specifying the relation between e1 and e2, is explicitly part of the makeup of the nouns' Formal role. Since e2 (the existence state) is not independently "accessible", *modulo* the event structure

composition and temporal overlap with e1, we propose that the y argument, corresponding to the verb internal argument and referring to the individual / physical object resulting from the construction event, is the second aspect of the sense bundle in the complex type. Hence, the Formal role encodes the causal relation between the two subevents in the noun *costruzione*: a process interpretation and an existence-state interpretation, which is only accessible indirectly, via its argument.

In this way, our representation is able to capture the polysemy between the *event* and the (*resulting*) *object*.

Let us now turn to the other *qualia* in the lexical representation. In line with the discussion on the asymmetry between the types in the complex in 3.2, our formal modelling envisages a split qualia representation. More specifically, we propose that the predicates in the qualia roles refer either to one or the other of the types in the dot. Therefore, the Agentive role encodes the causing process/activity in a *costruzione* event, which triggers the coming into existence of y, through transformation of material (z) into artifact (y). The Telic role specifies the function of a *costruzione* event, which is the accomplishment of the event itself, hence the existence of the object y. The Constitutive role encodes the material (z) out of which a construction (y) is made. Dot exploitation accounts for the relevant qualia role "activation" in the semantic composition process in the sentential context.

3.3.2 Re-description Nominals

The case of *costruzione* is not particularly challenging for modeling purposes, since the types in the dot object correspond to the Event argument and to a syntactic argument of the base verb. For most AN complex types, however, the situation is more complicated, since the result does not necessarily correspond to a syntactic position in the argument structure of the base verb. With the exception of nominals derived from creation verbs (e.g. *build*, *construct*, *create*, etc.), most result nominals do not introduce reference to an entity which corresponds to a syntactic argument of the base verb.

Let us consider *traduzione*, obtained by a re-description predicate, *tradurre* 'translate': the result of the event (i.e. *translation* as an informational object), although temporally and causally dependent on its accomplishment, is not expressed by a dedicated DP in the syntax. However, this piece of information, we claim, must be codified somehow in the semantic structure of the base verb and the derived nominal. We propose that it is encoded in the form of a semantic participant and, more specifically, as a “hidden argument” (cf. Badia and Saurí 2001) in the Argument Structure of the predicate *tradurre*, which, as it is known, does not only contain participants which are projected in the syntax but also those participants that are implied in verb semantics. As clarified in section 2, Argument Structure in GL is primarily conceived as a semantic layer of representation and although the hidden argument never surfaces in the verbal and nominal syntax, it is relevant for the interpretation of both verbal and, especially, nominal semantics, where it represents the result type in the dot object.

Concerning the derived nominal *traduzione*, inheriting both Event and Argument structure of the base verb, the hidden argument (z) in fig. 6, identifying the result of the event, surfaces at the level of both Argument Structure and Qualia Structure.

As explained in 3.2, the present analysis of Event Structure composition for creation events also applies to re-description events, envisaging the same precedence and overlap temporal relation between their subevents. Hence, also in this case, the event structure is made up of two subevents, with the second (partially) overlapping with the causing event. However, while the (syntactic) object of a creation event is the created entity, the (syntactic) object of a redescription event is the theme/source argument in the *first* subevent (its existence is not af-

fected by the translating event). The second subevent, whose temporal unfolding is overlapped by the causing process, becomes semantically accessible through the hidden argument (z), i.e. the info-object that comes into existence as the result of the translation process.

With these considerations on AS and ES in mind, we turn to the modelling of Qualia Structure for redescription nominals. Starting from the Formal quale, we propose that Cause is responsible for the relation between the sub-events in the complex type. However, in this case the existence subevent (e2) cannot be accessed through the internal argument (y) as with creation nominals, but through the hidden argument (z), which is the object that comes into existence throughout the unfolding of the event.

Further, the split QS implementation proposed for creation nominals also applies to redescription ones. Specifically, besides the Formal, the EVENT type envisages an Agentive role (encoding causing activity/process, e1) and a Telic role, where its function is understood as the accomplishment of the event itself, hence the existence of the result (the hidden argument z).

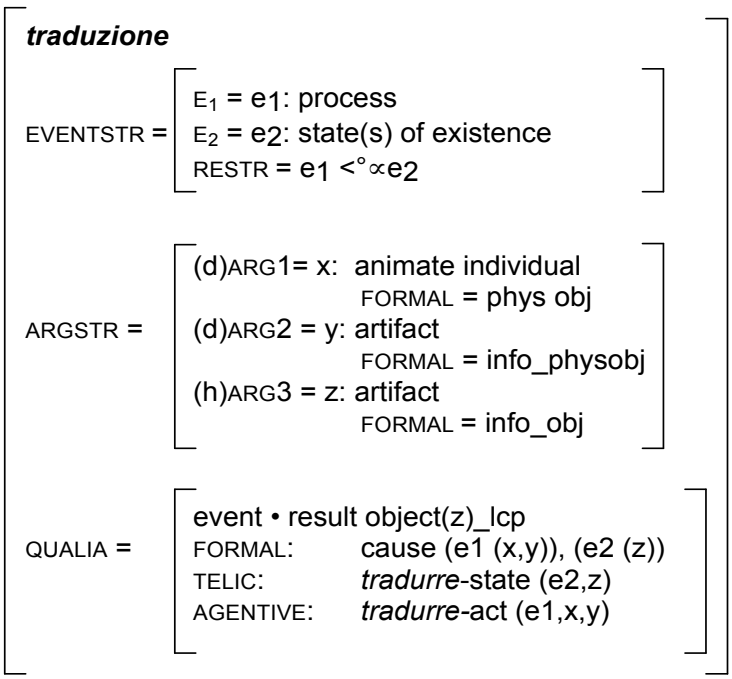


Fig. 6 *traduzione*

4 Co-predication Issues

After discussing the implications of Event Structure analysis for the inaccessibility to the result state interpretation for ANs and modelling their lexical representation in the GL framework, in this section we turn to the analysis of the behavior of ANs with respect to co-predication. Our aim is to show that the constraints on co-predication that these nominals exhibit can also be ascribed to the inherent properties of their subeventual structure, specifically to the temporal ordering between the subevents and the arguments associated with them, as discussed in 3.2. After some general remarks on co-predication, we therefore examine some empirical data to support this claim.

As mentioned in 2.2, co-predication is generally assumed to be the main diagnostic for complex types. In fact, the very reason why complex types were introduced in GL and distinguished from other kinds of regular polysemy, is because the former exhibit felicitous co-predications while the latter do not. It has also been noted, however, that co-predication does not work equally well for all kinds of complex types (as in the case of ANs) and, more importantly, that it may involve artifactuals as well (Asher & Pustejovsky 2006; corpus evidence in Pustejovsky and Ježek 2008). For example in (14), two senses of *vino* 'wine' (DRINK and CONTAINER) are predicated in the same context, the former by the modifier *rosso* 'red' (which, in GL terms, activates the Formal quale of wine), and the latter by the predicate *aprire* 'open', which selects an argument of type CONTAINER. However, despite the apparent co-predication, *vino* is generally assumed to be lexically associated with a simple artifactual type (DRINK) instead of a complex type CONTAINEE•CONTAINER and to license a sense extension to CONTAINER only contextually, as a coercion effect induced by the semantic requirements of the selecting predicate *aprire*. The idea behind this is that while co-predication activates a sense which is already available in the lexical item as a subcomponent of a complex type, coercion effects shift the type in context. Clearly, the distinction between these two operations is not always easy to draw.

(14) Il vino *rosso è stato aperto* con 30 minuti di anticipo.
'The red wine was opened 30 minutes in advance'.

Moreover, it has been noted that semantic anomaly with certain co-predications (zeugmaticity in Cruse's terms, cf. Cruse 2004) does not necessarily imply the absence of inherent polysemy. Particularly, Asher (2011) observes, for example, that with the noun *city* the order of senses seems to play a role in the acceptability of co-predication, suggesting that sense combinations may be subject to discourse effects:

(15) The city has 500 000 inhabitants and outlawed smoking in bars last year.
?The city outlawed smoking in bars last year and has 500 000 inhabitants.

Similarly, Brandtner (2009) notices that if the relation between the conjuncts is made more salient, the degree of felicity of a co-predication is higher:

(16) ?The newspaper was founded in 1878 and is printed in Frankfurt
The newspaper was founded in 1878 and is *still* typed in Sutterin.

Finally, from a structural point of view, what exactly counts as a co-predication is still controversial in the linguistic literature; particularly, it is unclear whether the term co-predication should be restricted to classic coordinative constructions as in (15) and (16), or if it should be extended to DP-VP structures of the type in (14) and structures where one of the selectors is located in a modifying (restrictive) subordinative clause as in (17) (taken from Jacquey 2001, 255):

(17) La construction, qui a commencé hier, sera très jolie.
Lit. 'The building, which started yesterday, will be very nice.'

With this background in mind, let us now turn to the analysis of co-predication data with ANs.

4.1 Co-predication with ANs

In general, if we adopt a classic notion of co-predication, according to which only coordinate constructions count as co-predications, our empirical investigation confirms what we know from existing linguistic literature, according to which co-predication with event/result nominals is infrequent. With the help of CQL, we looked for corpus instances of coordinative constructions containing either i. coordination between two adjectives, ii. coordination between an adjective and a complement modifying the nominal, iii. coordination between two verbs, but the resulting constructions appear to be extremely infrequent when compared with cases in which two selectors activate the same sense. In other words, most coordinate constructions appear to predicate over a single aspect of the type, either the EVENT as in (18) or the RESULT type as in (19):

(18) La costruzione fu lenta e paziente.
'The construction was slow and patient.'
(19) La costruzione era solida e stabile.
'The building was solid and stable.'

If, however, a broader notion of co-predication is adopted, in particular one which includes structures in which one of the predications is performed via a modifying relative clause, our analysis shows that ANs are found in a typology of co-predications sharing the following syntactic and semantic constraints:

(20) Constraints on co-predication with ANs

i. Split co-predication between main clause and subordinate clause;
ii. Temporal disjunction between the two predications;
iii. Omission of the internal argument.

We claim that the constraints in (20) receive a straightforward explanation if one takes into account the causal asymmetry that exists between the two elements that make up the complex types of ANs (cf. section 3.2 above). Not only are the EVENT and RESULT types radically distinct ontological categories, but the RESULT type is the causal by-product of the EVENT type and as such it is dependent on the EVENT type, but not viceversa. This asymmetry, we argue, challenges the chance of co-predication in coordinative constructions, because these constructions establish a parallelisms between the types, which is lacking in the case of ANs. By contrast, constructions consisting of a main clause and a dependent relative clause are asymmetric from a structural point of view and therefore more likely to contain ANs' co-predications.

Let's look in detail at three co-predication contexts for It. creation nominal *costruzione* 'construction' and redescription nominal *traduzione* 'translation' to clarify these points:

(21) La costruzione, che *si protrasse*$_{E}$ fino al XVII secolo, *rimane un'importante testimonianza*$_{R}$ della geniale tematica del Palladio.
'The building, which continued till the XVII century, represents an important evidence of Palladio's ingenious artwork'

In (21), *protrarre* 'continue' selects the EVENT type (E-type), while *rimanere un'importante testimonianza* 'represent important evidence' selects the RESULT type (R-type) of the complex

type *costruzione*.[7] We claim that co-predication is felicitous in this context because of three facilitating factors: a) type selectors (i.e. *protrarre* and *rimanere un'importante testimonianza*) are split between main clause (R-type) and relative clause (E-type) thus satisfying the asymmetry which characterizes the relationship between the two types; b) there is temporal disjunction between the E- and the R-type, namely Past for the E-type selecting predicate *protrarsi* and Present for the R-type selecting predicate *rimanere un'importante testimonianza*, and c) the internal argument is not realized (the RESULT interpretation would be blocked in case of internal argument projection as in *la costruzione della villa* 'the construction of the villa').
Let us now consider (22):

(22) Lungo le strade sulle quali sono indicati i punti di vista *devono essere vietate*$_{E}$ costruzioni che *impediscano*$_{R}$ le visuali del paesaggio.
'Along the roads where lookout points are indicated, one must prohibit constructions that block the visual views of the landscape'

In (22), *devono essere vietate* lit. 'must be prohibited' selects the E-type (one can clearly forbid an event to happen, but not an object) while *impediscano* 'block' selects the R-type. As in (21) we argue that co-predication in (22) is facilitated by the following factors: co-predication is split between main and relative clause, reference to the R-type is introduced prior to reference to the E-type and the internal argument of the Event reading is not realized.[8]
Finally let us examine an example of co-predication with It. redescription nominal *traduzione* 'translation':

(23) Una volta *completata*$_{E}$, la traduzione si può *caricare*$_{R}$ in una sezione apposita del sito.
Once completed, the translation may be uploaded in a special section of the site.

In (23), the implicit predicate *completata* 'completed', which agrees with *traduzione*, selects the E-type while *si può caricare* 'may be uploaded' selects the R-Obj type. Here, the R-Obj type selector is introduced in the main clause while the E-type is introduced in the subordinate clause; moreover, there is temporal disjunction between the types such that reference to the E-type precedes reference to the R-type. In this way, the internal asymmetry between the types is mirrored by the structural and semantic asymmetry of the co-predicative context.

5 Conclusions

This research, though focused on a class of nouns deeply studied in the linguistic literature, contributes to clarify the nature of an intriguing pattern of inherent polysemy. The event/result

[7] Note that *rimanere un'importante testimonianza* represents a copulative structure, insofar as the verb *rimanere* behaves as a copula in this context (cf. *essere un'importante testimonianza* 'to be an important evidence'). Although we are aware that copulative structures constitute a controversial case of copredication, we opted to include them in our data as borderline cases which deserve further investigation.

[8] An anonymous reviewer raised an interesting issue concerning the selective properties of the English synonym of *impedire* 'forbid', which could select for object-denoting nouns, such as in "Umbrellas are forbidden in here". We in fact believe that sentences like this one are instances of "type coercion", where the predicate *forbid* coerces the type of its selected object noun into an event by exploiting the underspecified predicate ("to use" or "to carry") in the Telic quale of the artifactual noun *umbrella*, so that the actual meaning of the abovementioned sentence is "Using/Carrying umbrellas is forbidden in here".

polysemy is in fact widely attested in deverbal ANs, but it stands as a peculiar case of type bundling when compared with standard cases of dot objects on both theoretical and empirical grounds.

Specifically, we have proposed that such polysemy is formally codified at the level of Qualia Structures of the base verbs and corresponding nominals. The relation between the senses is identified as 'causal' and specified in the Formal role of the nominal Qualia Structure. However, event/result nouns are crucially different from standard complex types, since the RESULT sense is causally dependent on the EVENT sense, a situation we refer to as (structural and semantic) asymmetry. Troubles with co-predication are the direct indication of such asymmetry and can be explained in relation to different syntactic and semantic requirements of the event and result types.

By examining the interplay between aspectual and lexical properties of event/result deverbal nouns and framing it in terms of asymmetric complex type, our study offers a new way to look at ANs and contributes to better understand the phenomenon of lexical polysemy.

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