

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
BRAIN AND COGNITIVE SCIENCES DEPARTMENT

BCS Memo

May 1994

A brief note on thematic roles

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This article describes research done at the Department of Brain & Cognitive Sciences of the Massachusetts Institute of Technology. Support for the research is provided by a Postdoctoral fellowship to the author from the Social Sciences and Humanities Research Council of Canada #756-93-0129.

0. Introduction

Since the very beginning of linguistic researches, everybody has always wanted to explain those semantic relations, apparently stable, that seem to hold between the noun and the verb (or more accurately, between the objects denoted by NPs and the event or state denoted by the verb). Indian grammarians, more particularly Panini, already recognize this particular aspect of language. The notion is then known as “karakas” or “causal relations”.¹

Coming to our century, Tesnière will deny the importance of the notion of predication in syntax, and therefore will centralize his descriptions on an other kind of opposition:

«Being based on principles derived from logic, the traditional grammar tries to recognize in a sentence a logic opposition between the subject and the predicate [...] We have to admit that this conception is only a residue of the period going back to Port-Royal and Aristotle, where all the grammar was based on logic.»² — Tesnière (1959, p. 103, §§2-4)

For Tesnière, the verb is the central masterpiece of a sentence. His position contrasts with Chomsky’s proposal to preserve the subject/predicate opposition. At the very time Tesnière conceived a syntax in a scenic manner (actancial or thematic) – the «little drama» expressed by the verbal node includes to this effect, «a process, [...], some actors and circumstances»³ — Chomsky proposed a univocal syntax that expresses predication; a syntax

¹ Originally, Panini proposed six karakas. The karaka “karman” (action, object, what is desired) is identified with accusative and groups together on the one hand, purely syntagmatic and logic relations, and on the other hand purely local and concrete relations. The karaka of “karana” (mean, instrument) and the karaka of “kartr” (agent, that which acts) covers the instrumental. The karaka “sampradana” (transmission, what we aim at by the object) is associated to the dative whereas the ablative is associated with the karaka “apadana” (removal, what is left when we move away) which groups indifferently, as with the karman, local and logical relations (indication of the cause). The same remark holds with the karaka “adhikarana” which, associated with the locative, describes the local space or the logic of an action, or the recipient of an action of an agent (after Hjelmslev (1935) , pp. 33-34).

² «Se fondant sur des principes **logiques**, la grammaire traditionnelle s’efforce de retrouver dans la phrase l’opposition **logique** entre le **sujet** et le **prédicat** [...] Il ne faut voir dans cette conception qu’une **survivance** non encore éliminée, de l’époque, qui va d’Aristote à Port-Royal, où toute la grammaire était fondée sur la logique.»

³ Tesnière (1959, p. 102§1). This conception to the effect that the verbal node is a process does not presume, we suppose, that the noun and the verb are opposed according to this criterion. As clearly shown by Benveniste (1950) , «an opposition between “process” and “object” in linguistics cannot have a universal validity, is not a stable criterion and does not even have a clear meaning.» («une opposition entre

that mediates the proper correspondences between phonological and semantic interpretations and representations.⁴

This system that is usually called the “Standard Theory” proposes a configurational definition of grammatical functions. However very little is advanced to properly define thematic relations (or case relations for Fillmore, actancial for Tesnière) since the effort, at the time, is put somewhere else. Feeling that these relations should have a more important place in the grammar, Fillmore introduces, at the end of the sixties, a case conception of syntax⁵. In a series of articles, among which the better known is undoubtedly “The Case for case”,⁶ he comes to propose a finite list of universal cases (e.g. Agent, Dative, Instrumental, Locative, Objective) which are distributed by the verbal node to each actancial place according to the verbal valency. By this scenic conception⁷, Fillmore is thus, in a sense, following a tesnerian view of syntax.

Before pursuing this historical review, it is necessary to clarify the terminology often used by these authors. We are following Anderson and Starosta’s presentations (Anderson, 1975; Starosta, 1975) .

A **case marker** designates the effective manifestation of a case form. In this sense, case markers correspond to what is observed overtly in a particular language (e.g. preposition, postposition, noun and verb inflexion, etc.). At this level of analysis very little is said about the universality of “thematic relations” underlying these markers. The next step is to define a possible universal set of **case forms**. Although the idea is seducing, an agreement among researchers on the content of this ideal finite set was never reached. Accusative, Nominative, Dative, Genitive and Ergative cases are the more or less stable members of that set which is

“procès” et “objet” ne peut avoir en linguistique ni validité universelle, ni critère constant, ni même sens clair.» [p. 152])

⁴ It should be noted that this scenic characterization of language is not emerging with Tesnière. In a very important work about “what his semantics”, Bréal mentions: «If it is true, **as people as sometimes claimed in the past**, that language is a drama in which words figure as actors and in which grammatical organization reproduces movement of characters, we have to at least rectify this comparison by taking into account a special circumstance: very often the impresario interferes in the action and blends to it his reflections and feeling.» (Bréal (1897) , p. 234, «S’il est vrai, comme on l’a prétendu quelquefois, que le langage soit un drame où les mots figurent comme acteurs et où l’agencement grammatical reproduit les mouvements des personnages, il faut au moins corriger cette comparaison par une circonstance spéciale: l’impresario intervient fréquemment dans l’action pour y mêler ses réflexions et son sentiment.») . One cannot help but notice the past tense used by Bréal.

⁵ Petitot-Cocorda (1985) cites [p. 153] among other references: Fillmore (1966, 1968, 1969, 1970, 1971, 1972) . We had access to Fillmore (1968, 1970, 1975, 1977) .

⁶ Fillmore (1968)

⁷ This view will be further developed in “The case for case reopened” (Fillmore, 1977).

very often enlarged with the Locative and Benefactive cases. These forms are thought to be realized according to different markers in each particular language.

The task of identification and classification of these forms is complicated by the fact that the mapping form-maker is not univocal. However, let us suppose that this finite set of forms exists and that it can be well defined by the syntactic function of the case form examined.⁸ The “meaning” (“signification”) of a case form is then, for the most part, of a syntactic nature.⁹

The **case relations** constitute the set of thematic roles. Thus, they are subordinated to a semantic interpretation according to which they designate the relevance (in terms of participant hood) of each object and person partaking in the event denoted by a sentence. Because of this intuitive characterization, their meaning is thought to be of a semantic nature. It is the generalization of the mapping between these relations and the forms/markers realizing them that constitutes the main obstacle for every theory based on these abstract concepts.

In the rest of this study, we will use “role” and “relation” indistinctly to express this “semantic” notion.

The three basic notions we just presented are summarized in (1).

(1) **Case notions**

Case marker: the effective manifestation of a case form and specific to a particular language.

Case form: the particular syntactic function of a class of case markers that can be visible or not.

Case relation: the semantic function of participant hood of a class of terms identifying persons and objects involved in the event denoted by a sentence.

Example: «in ‘Lutetiam veni’, we can say that the noun [wearing the case **marker** ‘am’] is in the Accusative **form** which express the Goal **relation**» — Anderson (1975, p. 18)

⁸ Benveniste (1962) , p. 148 proposes such a view in his analysis of Latin Genitive case: «the particular “meaning” attached to each uses of the Genitive case is also derived from the grammatical values of “dependence” and “determination” that are inherent to the essential syntactic function of the Genitive case.» («le “sens” particulier attaché à chacun [des] emplois [du Génitif] est lui aussi dérivé de la valeur grammaticale de “dépendance” et de “détermination” inhérente à la fonction syntaxique primordiale du génitif.»)

⁹ We group here, for expository purpose, the Structural and Inherent Cases proposed in Chomsky (1986, p. 193 et ss.)

1. The verb as a “role distributor”: the form is relation

From the above definitions, it is easy to note that the discovery of a direct mapping between case relations and case forms would mean that we have been able to present an underlying “meaning” to each “traditional” Cases. We all know that Hjelmslev attempts such an enterprise; we will come back on his research later on. In a first series of article, Fillmore (1968) groups together the forms and the relations underlying them. Everything becomes, as a matter of speaking, “semantics” (even if he insists on the central character of syntax). Let us see how he proceeds.

For him, a predicative configuration has nothing to say about deep case relations since it does not take into account the “invariant” attribution of these “semantic” relations (e.g. in passivation). A long reflection leads Fillmore to abandon the categorial component and to adopt a case-based grammar. In so doing, the syntactic structure is deeply changed (see figure 1).

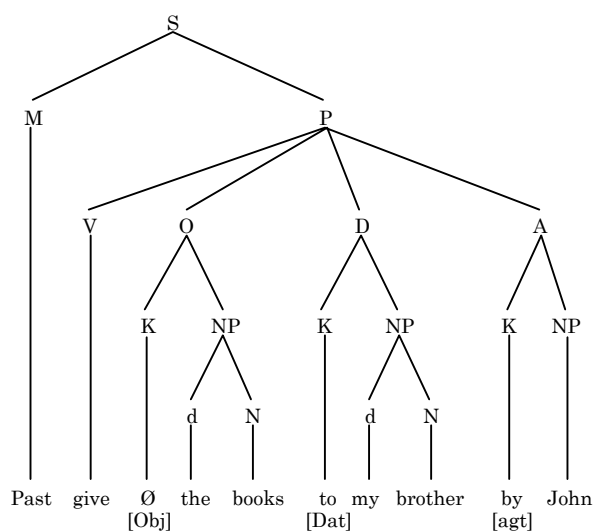


Figure 1

Deep structure of *John gave the books to my brother* . Three transformations will be used to generate the surface structure of this sentence: subject advance, deletion of the subject preposition, and deletion of the object preposition (noted Ø in the diagram) (after Fillmore (1968, p. 35)).

Starting with this hypothesis, Fillmore will use, following Tesnière in this respect, the verb as a central node which will distribute Deep Cases (case forms) to each NP contributing to its defined valency. Each of these case nodes (actancial place in Tesnière) is composed of one marker (exemplified by its position within the linear order, a particular inflexion, a preposition, a postposition, etc.) and one NP. A set of transformational rules will determine which of these NPs will become Subject or Object.

Still, there is many problems with this hypothesis. The mapping between the relations (semantic roles) and their realized form is not simple and cannot be generalized easily. These ‘concepts’ raise two difficulties. First, the intuitive foundation of each relation type (which

are very often considered wrongly as true categories) leads to their elimination by generalization, or their proliferation by specialization. Second, as a consequence of the first difficulty, a finite set (or even a bounded set) of relations does not seem to cover all facts. These two difficulties are the result of having associated to these relations situational definitions that make it difficult, or else impossible, to hold the initial hypothesis of Fillmore to the effect that each case form selects in a univocal manner one relation (that is one role).¹⁰

In many cases, semantic roles attached to ‘actants’ are the manifestation of many forms. In (1a), *Pierre* (destination role) can be viewed as an Agent and a Source, and *Claire* (destination role) is associated with the Dative and Goal role. A problem arises in (1b) where *wind* is both Agent and Instrument. The problem will be ‘solved’ by the introduction of a new case relation, Force. These adds-on are an exemplification of the proliferation phenomena mentioned above.¹¹

- (1) a. Pierre a donné un livre à Claire.
Pierre gave a book to Claire.
b. Le vent a cassé la branche.
The wind broke the branch.

The problem is profound since case forms, now indistinguishable from the semantic relations, of which they are the manifestation, are thus defined with the help of a situational interpretation of the verb, and not by its instructional meaning. Within this line of thoughts, *de Paris* in (2a) becomes an Objective (or a topic of conversation), at the very time, it becomes a Locative Source in (2b).

- (2) a. Nous avons parlé de Paris.
We spoke about Paris (litt.: We spoke from/of Paris)
b. Pierre est venu de Paris.
Pierre came from/of Paris.

The verb is then viewed as a role/form distributor (figure 2) according to the range of situations it can denote. Roles are associated to specific places and nothing can simplify the interpretative constraints between them, except for their syntactic positions. It is then very difficult to generalize the surface realization mechanism (prepositions, affixes, etc.) of all these deep cases.

¹⁰ Semantic roles can be discovered and justified by syntactic criterias.

¹¹ Many linguists that work within the large domain of “Case Grammar” did not agree with Fillmore on the pertinence of these solutions. Chafe (1970) , for example, will propose instead to associate with words like *wind* the feature *potent* in order to enlarge the Agent notion (p.109). Anderson (1975) will not accept either this case difference. For him (p.30), Cases like Force and many other Instrumental should be classified under the Agent case (case A).

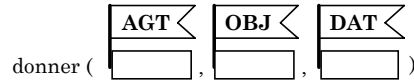


Figure 2

A verb viewed as a role distributor.

Push to its limit, this view leads to the construction of dubious paradigm in which the meaning of prepositions or even verbs is not, strictly speaking, taken into account, and is instead replaced by the individual properties of objects in the world as defined by our current knowledge. It suffices to consider the sentences illustrated in (3) and (4) to realize what kind of ‘principle way’ is at play here to evaluate the mapping between one role and one NP (from Nilsen & Nilsen (1975, p. 93 et 95)).

- (3) a. *This ax* will cut plastic.
- b. He bought *an ax* yesterday.
- c. He damaged the carton *with his new ax*.

- (4) a. *John* received a “dear John” letter from Mary.
- b. Mary saw *John* the next day.
- c. Mary sent her hotel key to *John*.

For these two authors, these sentences illustrate that Instrumental and Goal Deep Cases, in (3) and (4) respectively, can appear within different syntactic positions (subject, direct object and prepositional object). We choose these two paradigms to illustrate where the idea of viewing Case Relation as a bag of fixed properties (or as labels for that matters) without taking into account the meaning of the verb or the preposition involved can lead to. In other words, according to this view, because the referent of an *ax* is usually a tool, it remains such (that is, an Instrument) no matter which verb or which preposition is involved.

These examples illustrate also the necessity to clear up the distinction between properties that are attributed to objects according to their very own nature, and properties that are attributed to them when they are inserted in a specific syntactic position on the one side, and in a specific semantic position on the other. According to a referential viewpoint of meaning, an *ax* remains an *ax* no matter the sentence it is involved in, but according to an internal viewpoint of meaning, that is within the ‘event’ *sentence*, its participant function (that is, its role) can be modified according to the lexical meaning of other ‘pieces’ involved. In other words, some “participancy” properties of an object become pertinent to the interpretation of the sentence only in some circumstances. It is this characteristic that Fillmore is referring to as a slogan in “The Case for Case reopened” in saying «meanings are relativized to scene», and it is also what will permit him to distinguish more clearly the Case Form from the Case Relations.

2. Labels and computation

Let us now turn to the proposals offered in Computational Linguistics. Paradoxically, the situation is not better. Nevertheless, we have come to believe that since a computational case theory must be effective, in some way, such a theory should be clearer or at least better

formalized. However, and since the machine plays blindly with symbols (*signs* might be more appropriate here), very little (at least at the level of implementation) is done to give epistemological justifications.

«The meaning of the case is not explicitly defined, but it is assumed to be astounded by the subsequent examples.» — Sparck Jones & Boguraev (1987, p. 66)

Spark Jones and Boguraev identify in this manner, following on this account the work of Wood (1979) , not less than 28 case labels. Even if people do not always mention the limits of these approaches, they are, at least, careful. So is Allen (1987) who speaks of «possible semantic roles» [p. 203] when he introduces some case labels (forms and relations), and of «usual realizations» [p. 205] when he will mention their surface realization (markers included) of some cases. Moreover, it is with much candor that Winston will inform his readers that:

«The number of thematic roles embraced by various theories varies considerably. Some people use a half-dozen thematic roles. Others use three or four times as many. The exact number does not matter much as long as there are enough to expose natural constraints on how verbs and thematic role instances form sentences.» — Winston (1984, p. 314)

How can a semantic calculus be proposed using these so badly defined primitives ? The answer is straightforward; we use them as literal signs. It is, in fact, a very good example of what we have called elsewhere the “black box trap” (Ratté (1993), chapter 1). Indeed, if we suppose that a mechanism M1 can correctly distribute these labels, the mechanism M2 using the results of M1 does not have to question itself on the pertinence of these labels.¹²

It is easy to imagine the technique we could use. Consider the lexical entries in (5a) and (6a), which identify the ‘semantic’ of the verb *donner* (*give*). The first entry, in (5a), is inspired by the work of Davidson (1967) as revised by Castañeda (1967) . The second entry is inspired by Parsons (1990) (*par=by, à=at*). These examples are taken from two grammars developed by the Interdisciplinary Group of Research and Study in Computational Linguistics of UQAM (Ratté (1990), Bouchard, Emirikian & Morin (1992), Emirikian & Bouchard (1992)). These grammars were constructed to illustrate how can be built a basic semantic interpretation in a parser.

(5) $\lambda y [\lambda z [\lambda x [\exists e [\text{Event}'(e, \text{donner}') \text{ agt}'(x, e) \text{ thm}'(y, e) \text{ ben}'(z, e)]]]]]$

(6) a. *donne* : $\lambda e [\text{Event}'(e, \text{donner}')]$
 b. *à* : $\lambda x [\lambda e [\text{ben}'(x, e)]]$
 c. *par* : $\lambda x [\lambda e [\text{agt}'(x, e)]]$

¹² This is probably related to the ‘nominalism trap’: to give a name to a problem never explains it.

In both cases, a semantic translation rule is associated to a syntactic rule (which are Immediate Dominance rules in the sense of Gazdar et. al (1985)). In the first example, the translation rules are very simple, being described by first order functional application, each argument instantiates one position-variable. The derivation tree of (1a) is illustrated in figure 3. The semantic translation rule associated to the construction of each phrase is presented under the relevant syntactic category, the result of the translation appears on the third line of each node. As the reader will realize, in this version, prepositions are not associated with a translation rule (the symbol • represents such an empty semantic translation).

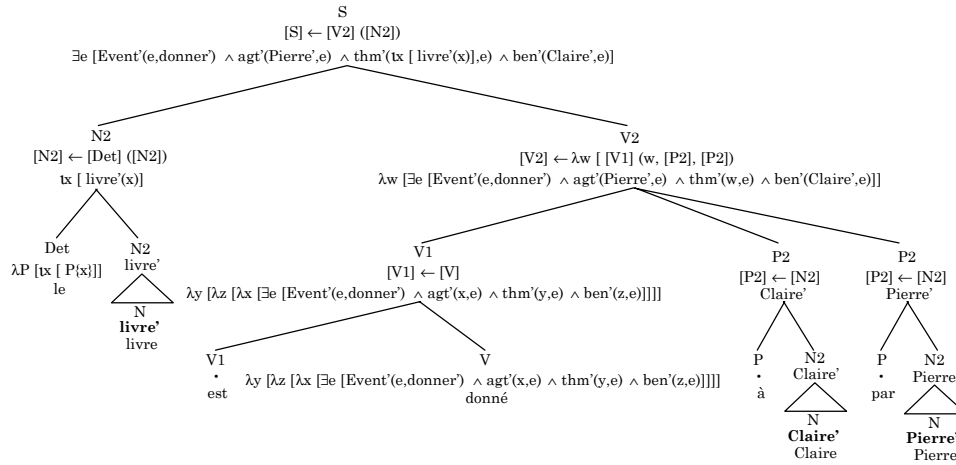


Figure 3

In the second case, that (6), each preposition constructs a part of the event. The semantic rule assigned to a prepositional phrase construction inserts this relevant part into the translation formula. The derivation is illustrated in figure 4.

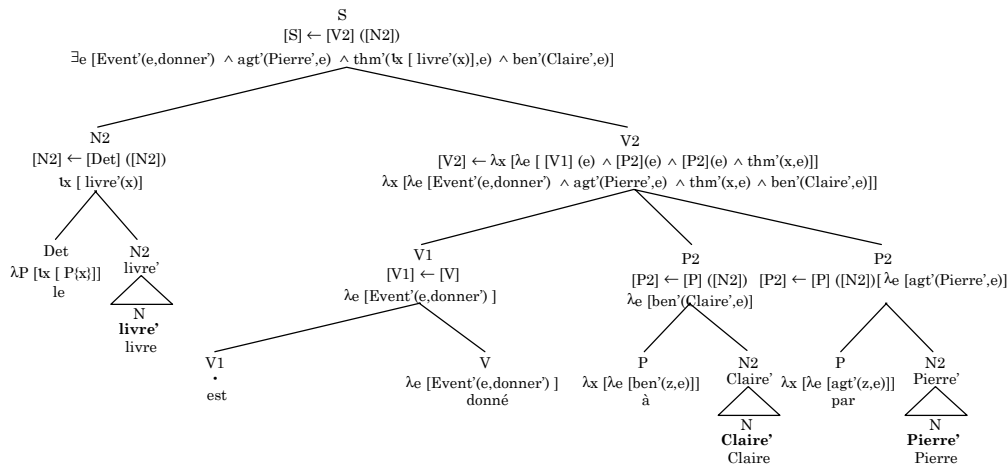


Figure 4

We can note that within such a system, roles do not 'select' arguments; they simply identify the object/position that should bear these roles. In these circumstances, when (7a') is

interpreted, the resulting value will be true if, in the world, *Pierre* can be considered as an Agent (whatever this notion covers), it will be false otherwise (ex. (7b')).¹³

- (7) a. Pierre a donné le livre à Claire.
 Pierre gave a book to Claire.
 a'. $\exists e$ [Event'(e,donner') agt'(Pierre,e) thm'(livre,e)
 ben'(Claire,e)]
 b. Le marteau a donné le livre à Claire.
 The hammer gave a book to Claire.
 b' $\exists e$ [Event'(e,donner') agt'(marteau,e) thm'(livre,e)
 ben'(Claire,e)]

These two examples illustrate what could be qualified as an 'interpretative' use of role labels. However, these direct and predetermined *attributions* of case relations to markers or argumental positions do not explain why these specific correspondences are (or should be) observed, neither why strong syncretism between some case relations and some case forms are found in many languages (as noted by Croft (1991)).

Within other applications in computational linguistics, researchers proceed in reverse. In that case, selectional properties of thematic labels are used instead of their 'interpretative' properties, to eliminate what is considered to be semantic anomalies. Systems developed by Wilks (1975a,b), Wilks, Huang & Fass (1985) , Hirst (1987) or Charniak (1978) can be cited, among many others (in this connection, almost every work dealing with selectional restrictions in parsers can be added to the list), as representative of this approach. Because as before, relation labels are associated specifically to positions or markers, this 'selective' approach does not explain particular correspondences, neither the existence of syncretism alluded to above. According to this view, the semantic *anomaly* of sentence (8) should be described as a violation of the rule according to which the verb *maudire* (*to curse*) demands a type of Agent, that is an animate object. On the contrary, following an 'interpretative' view (which is probably more in accordance with the effect wanted by the author of this sentence), the *ax*, in this example, becomes, by its utilization with *maudire*, a kind of agent; it becomes, so to speak, animate.

- (8) Et la *hache* maudit les hommes.¹⁴
 And the ax curses the men.

¹³ We leave aside, in these translations, the operator iota (noted ι) used in Gamut (1991, pp. 159 ss.) as an abbreviation of (1') where Q will be replaced by a given predicate.

(1') $\exists x [\forall y [\text{livre}'(y)/y = x] \quad Q(x)]$

This notation allows to translate (2'a) by the formula (2'b) instead of (2'c).

(2') a. la femme marche. ('the women walks')
 b. marche'(ix [femme' (x)])
 c. $\exists x [\forall y [\text{femme}'(y)/y = x] \quad \text{marche}'(x)]$

¹⁴ Victor Hugo, *Les Contemplations* [example from Ducrot & Tudorov (1972, p. 169)].

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