The analysis of the relative, completive and indirect interrogative subordinate constructions in French by means of the Applicative and Combinatory Categorial Grammar

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ABSTRACT

In this article we will present a classification and an analysis, by means of Applicative and Combinatory Categorial Grammar (ACCG), of relative, completive and indirect interrogative propositions in French introduced by "que" and "qui". Applicative and Combinatory Categorial Grammar is a generalization of standard Categorial Grammar. It is represented by a canonical association between Steedman's Combinatory Categorial rules and Curry's combinators. This model is included in the general framework of Applicative and Cognitive Grammar with three levels of representation: (i) phenotype (concatened expressions); (ii) genotype (applicative expressions) ; (iii) the cognitive representations (meaning of linguistic predicates). We are interested only in phenotype and genotype levels.

The model of Applicative and Combinatory Categorial Grammar

The model of Applicative and Combinatory Categorial Grammar (ACCG) falls under a paradigm of language analysis that allows a complete abstraction of grammatical structure from its linear representation due to the linearity of the linguistic signs and a complete abstraction of grammar from the lexicon. According to the framework of Applicative and Cognitive Grammar (Desclés 1990, 1996) and Applicative Universal Grammar (Shaumyan 1998), the language analysis has to postulate three levels of representation:

(i) The *phenotype level*, where the particularly characteristics of natural languages are expressed (for example order of words, morphological cases, etc...). The linguistic expressions of this level are concatenated linguistic units according to the syntagmatic rules of the language concerned.

(ii) The *genotype level*, where grammatical invariants and structures that are underlying to sentences of phenotype level are expressed. The genotype level uses a variable-free formal language, called *Genotype Calculus*, as its formal framework. Genotype Calculus is an applicative semiotic system used as a formal metalanguage for describing natural languages. In this level functional semantic interpretations are expressed by means of combinators, which are abstract operators who allow to build more complex operators. According to (Curry and Feys 1958) each combinator is associated with to a B-reduction rule. For instance, we present combinators **B**, $\mathbf{C}_*$,with the following rules (U_1, U_2, U_3 are typed applicative expressions) :

$((\mathbf{B}\ U_1\ U_2)\ U_3)$ –> $(U_1\ (U_2\ U_3))$
$((\mathbf{C}_*\ U_1)\ U_2)$ –> $(U_2\ U_1)$

(iii) The *cognitive level*, where the meanings of lexical predicates are represented by semantic cognitive schemes.

Applicative and Combinatory Categorial Grammar (ACCG), (Biskri and Desclés 1997) (Biskri and Delisle 1999), explicitly connects phenotype expressions to its underlain representations in the genotype (functional semantic interpretation).
ACCG, like all Categorial Grammar models, assigns syntactical categories to each linguistic unit. Syntactical categories are orientated types developed from basic types and from two constructive operators '/' and '\' (for more details see (Morrill 1994) (Moorgat 1997) (Steedman 2000) (Dowty 2000).

(i) N (nominal syntagm) and S (sentence) are basic types.

(ii) (ii) If X and Y are orientated types then X/Y and X\Y are orientated types. According to Steedman's notation (2000), X/Y and X\Y are functional orientated types. A linguistic unit 'u' with the type X/Y (respectively X\Y) is considered as operator (or function) whose typed operand Y is positioned on the right (respectively on the left) of operator.

In our paper, a linguistic unit u with orientated type X will be designed by '[X : u]'.

Let us provide now ACCG rules used in this paper. To see the whole of the rules the reader might have a look on (Biskri and Desclès, 1997) :

Application rules :	[X/Y : u_1] - [Y : u_2] ----------> [X : (u_1 u_2)]	; [Y : u_1] - [X\Y : u_2] ---------- [X : (u_2 u_1)]
Type-raising rules :	[X : u] ----------**>T** [Y/(Y\X) : (**C**$_*$ u)]	
composition rules Functional:	[X/Y : u_1]-[Y/Z : u_2] ----------**>B** [X/Z : (**B** u_1 u_2)]	

The premises in each rule are concatenations of linguistic units with orientated types considered as being operators or operands, the consequence of each rule is an applicative typed expression with an eventual introduction of one combinator. The type-raising of an unit u introduces the combinator **C**$_*$; the composition of two concatened units introduces the combinator **B** and **S**.

Let us deal with a simple example:

La liberté renforce la démocratie (Freedom reinforces democracy)

1. [N/N : *la*]-[N : *liberté*]-[(S\N)/N : *renforce*]-[N/N : *la*]-[N : *démocratie*]
2. [N : (*la liberté*)]-[(S\N)/N : *renforce*]-[N/N : *la*]-[N : *démocratie*] **(>)**
3. [S/(S\N):(**C*** (*la liberté*))]-[(S\N)/N: *renforce*]-[N/N: *la*]-[N: *démocratie*] **(>T)**
4. [S/N : (**B** (**C*** (*la liberté)) renforce)*]-[N/N : *la*]-[N : *démocratie*] **(>B)**
5. [S/N : (**B** (**B** (**C*** (*la liberté)) renforce) la)*]-[N : *démocratie*] **(>B)**
6. [S : ((**B** (**B** (**C*** (*la liberté)) renforce) la) démocratie*)] **(>)**

7. [S : ((**B** (**B** (**C*** (*la liberté)) renforce) la) démocratie*)]
8. [S : ((**B** (**C*** (*la liberté)) renforce)* (*la démocratie*))] **B**
9. [S : ((**C*** (*la liberté)*) (*renforce* (*la démocratie*)))] **B**
10. [S : ((*renforce* (*la démocratie*)) (*la liberté*)))] **C***
11. [S : *renforce* (*la démocratie*) (*la liberté*)]

The first step consists in assigning syntactic types to the lexical units. Those are entries of a dictionary where each unit is associated to one or more types.
Steps 2 to 6 consist in operating the rules of the ACCG in the way to check the syntactic correctness on the one hand and progressively to build the predicative structures by the introduction of combinators with the syntactic process. Thus, step 2 consists in applying the rule (>) to the linguistic units: *la* and *liberté*. The subject *la liberté* is then built. The third step sees the introduction of the combinator **C***. Applied to the operand *la liberté*, **C*** makes it possible to build an operator (**C*** (*la liberté*)) that we compose at step 4 with the operator renforce with using the rule (>B) the result is a more complex operator (**B** (**C*** (*la liberté*)) *renforce*). This last operator is composed in step 5 with *la*. Step 6 is the application of the operator (**B** (**B** (**C*** (*la liberté*)) *renforce*) *la*) to the operand *démocratie*. Steps 1 to 6 occur in the phenotype. Obtaining the type S at step 6 guarantees the syntactic correctness of the statement. Steps 7 to 11 are a natural deduction in the genotype, which consists in eliminating the combinators according to the B-reduction rules shown previously. The predicative structure of the genotype level obtained at the step 11 : *renforce* (*la démocratie*) (*la liberté*),

represents the functional semantic interpretation of the given sentence : *la liberté renforce la démocratie.*
With such a model, we have analysed in previous works many complex constructions like coordination, sentences with backward modifiers, etc. In this paper we will present the analysis of relative, completive and indirect interrogative constructions in French.

The relative, completive and indirect interrogative constructions in French and the ACCG

The concept of relation between two sentences is significant in the case of the French subordinate clauses, since subordination is a syntactic relation of dependence between linguistic units. The subordinate clause always depends from another proposition. It should be noted that the category of the subordinate clauses is not well defined in French, since certain propositions which do not have any syntactic dependence relation with another proposition are classified as subordinate clauses. The problem of our research is formulated as follows: How are the subordinate relative, completive and indirect interrogative clauses categorised in order to support the automatic processing of the natural languages? We wanted to analyze at the same time relative, completive and indirect interrogative propositions because their categories share the same syntactic structures and occupy sometimes similar syntactic functions in speech. The analysis was made on a corpus which gathers more than one hundred of different propositions. However, in our article, we will limit ourselves for practical reasons to the following propositions:

i) *Qui m'aime me suive* (who loves me has to follow me) : relative proposition
ii) *Que tu m'aimes me réjouit* (that you love me, delights me) : completive proposition
iii) *J'aime la personne qui m'aime* (i love the person who loves me) : relative proposition
iv) *J'aime qui tu aimes* (i love whom you love) : relative proposition
v) *J'aime que tu viennes* (i love that you come) completive proposition
vi) *Pierre aime qui l'aime* (Pierre loves who loves him) : relative proposition
vii) *Pierre se demande qui l'aime* (Pierre wonders who loves him) : indirect interrogative proposition
viii) *La femme que tu vois est ma sœur* (the woman that you see is my sister) : relative proposition
ix) *La femme qui vient est ma sœur* (the woman who comes is my sister) : relative proposition
x) *Le scientifique parle de l'objet que Pierre trouva* (The scientist speaks about the object which Pierre found) : relative proposition
xi) *La robe que tu vends intéresse cette cliente* (The dress that you sell interests this customer). : relative proposition
xii) *L'officier, qui donne les ordres, a déposé son fusil* (The officer, who gives the orders, deposited his rifle). : relative proposition
xiii) *Heureux qui frissonne aux miracles de cette poésie* (Happy who shivers with the miracles of this poetry). : relative proposition
xiv) *Il écrase qui ne lui obéit* (He crushes who does not obey to him). : relative proposition
xv) *Pierre entend le voisin qui chante (Pierre hears the neighbour who sings).* : relative proposition

A subordinate clause is a proposition which depends on a main clause and which is often attached to it by a subordinating conjunction, a relative pronoun, a relative adjective, an interrogative pronoun or an interrogative adjective. However, *certain* syntagms which do not have any relation of dependence and which are thus not subordinate clauses are classified in this category. The phenomenon can be observed for relative and completive syntagms which occupy, for instance, the function of grammatical subject. In the sentence *i*, the relative clause *qui m'aime* is the subject of the verb *suive*.
In the sentence *ii*, *que tu viennes* is the subject of the verb *réjouit.*

$$[Qui\ m'aime]_{\mathbf{N}}\ me\ suive$$
$$[Que\ tu\ m'aimes]_{\mathbf{N}}\ me\ réjouit$$

The subject cannot be logically subordinate to the verb. The classification of the relative and completive clauses under the category of subordination as presented in Handbooks of Grammar like Grévisse (1991) is not conform to grammatical reality as it is observed in the two preceding examples. AS for them, the indirect interrogative propositions are subordinate clauses which are introduced by a verb introducer expressing the interrogation and an interrogative word such as *qui, quand, comment*. There are two types of relative clauses and two types of indirect interrogative propositions: the propositions which are introduced by an antecedent and the propositions which do not have any antecedent.
Thus, the relative clause *qui m'aime* in the sentence i do not have any antecedent, whereas, in the sentence iii, the relative clause *qui m'aime*, has an antecedent, the word *personne* of which it is a backward modifier.

$$J'aime\ la\ [personne]_{\mathbf{N}}\ [qui\ m'aime]_{\mathbf{N\backslash N}}$$

It is possible to propose a classification, according the ACCG model, which respects the structure of this study's propositions. The analysis of various relative, completive and indirect interrogative clauses presented here shows that they often share common syntactic structures, and, different nouns were frequently used to identify similar

syntactic constructions. For instance, sentences iv and v have similar structures: *subject + verb + object*.

$[J']_{N}\ [aime]_{(S\backslash N)/N}\ [qui\ tu\ aimes]_{N}$
$[J']_{N}\ [aime]_{(S\backslash N)/N}\ [que\ tu\ viennes]_{N}$

The propositions *qui tu aimes* and *que tu viennes are* are classified in different categories, that is to say respectively in the category of the relative clauses and the category of the completive clauses. The principal difference is that the two propositions have not the same referent.

The operators being used to build the relative clauses and the completive clauses in French can be divided into two main categories: (i) "builders" of nouns; (ii) "builders" of modifiers. The true distribution of the relative, completive and indirect interrogative propositions is done under these two categories. It is noticed that these propositions act in the same way that substantives or adjectives. The propositions which are built with a «builder» of noun can be subjects, attributes, direct objects, indirect objects, whereas the propositions which are built with a "builder" of modifiers often act like adjectives, and even sometimes like adverbs. The propositions can achieve in syntax the same functions as the linguistic units which make it possible to form the language such as the substantives and the adjectives.
In the sentences i and ii, *qui* and *que* are "builders" of nouns. The difference between the proposition *qui l'aime* in sentences vi and vii is the meaning of the verb who introduces this proposition.

Pierre aime $[qui\ l'aime]_{N}$
Pierre se demande $[qui\ l'aime]_{N}$

In the sentences viii and ix, *qui* and *que* are "builders" of modifiers. The syntagms *que tu vois* and *qui vient* are both modifiers of the syntagm *la femme*.

La $[femme]_{N}$ $[que\ tu\ vois]_{N\backslash N}$ *est ma sœur*
La $[femme]_{N}$ $[qui\ vient]_{N\backslash N}$ *est ma sœur*

As it is possible to note it, the difference is not relatively to a syntactic criterion, but to a semantic criterion (Girard, 2001). In addition, the classification of *qui* (relative and interrogative pronoun cases) and of *que* (completive cases) as «builder» of noun is justified by the fact that the two operators allow the construction of syntagms referring a part of reality (an object entity): *qui m'aime, qui vient, qui pense*… The difference between the two is that *qui* (relative and interrogative pronoun cases) makes it possible to refer people, whereas *que* (completive cases) references a verbal action or a state indication: *que tu m'aimes, que tu viennes, que tu penses*… The *qui* in interrogative cases can also be a «builder» of noun: the proposition that it used to build can however be only object of the verb.

The relative and completive clauses "builders of nouns" can occupy a multitude of functions in the sentence: subject, direct object, indirect object, attribute. Their "versatility" can easily be compared with certain noun phrases such *une pomme, une fille, un homme*… We can consequently easily replace propositions by linguistic units of different meanings but of the same syntactic structure.
By this observation we notice that the language generalizes its behaviour to the whole of the units that constitute it, since noun phrases and propositions as complex as relative and completive clauses can occupy similar functions in speech.

It should however be mentioned that there is a principal difference between the relative clauses and the completive clauses "builders of nouns": the concept of quantification. Thus, the sentences *Qui m'aime me réjouit* and *Que tu m'aimes me réjouit* contain a major difference in their meaning: *Qui m'aime* can be interpreted by all those who like me and it becomes introducer of a universal quantification on a set containing the persons who like me, whereas *Que tu m'aimes* introduces only the fact that you like me.

What must retain our attention remains the fact that the pronouns *que* and *qui* are perceived as operators who attach what we will call anyway the subordinate proposition to the main proposition. That is what assumes traditional Grammar. With Categorial Grammars, this aspect of the pronouns is included in the syntactic categories assigned to them. Each syntactic category reflects the way in which the pronoun will operate on both of the main and the subordinate propositions to attach them. Thus, in (x) as in (xi) and in (viii) the pronoun *que***,** after being applied to a "NP-Verb" proposition ($[Pierre]_{NP}$ $[trouva]_{Verb}$), modifies a Noun ($[objet]_{Noun}$) in order to give a complex Noun ($[objet\ que\ Pierre\ trouva]_{Noun}$. We can assign the category (N\N)/(S/N) to the pronoun *que*.
In (xii) as in (ix) the pronoun *qui***,** after being applied to a "Verb-NP" proposition ($[donne]_{Verb}$ $[les\ ordres]_{NP}$), modifies a Noun ($[officier]_{Noun}$) in order to give a complex Noun ($[officier,\ qui\ donne\ les\ ordres]_{Noun}$. We can assign the category (N\N)/(S\N) to the pronoun *qui*.
In (i) as in (xiii) and in (xiv) *qui***,** is applied to an intransitive verb (*m'aime* in (i), *frissonne aux miracles de cette poésie* in (xiii), *ne lui obéit* in (xiv)) which category is S\N in order to contruct a noun (*qui m'aime* in (i), *qui frissonne aux miracles de cette poésie* in (xiii), *ne lui obéit* in (xiv)). Thus, here, we can assign the category N/(S\N) to the pronoun *qui*. This category reflects the universal quantification nature of the pronoun *qui* in what we will call substantive subordinate constructions.

We summarize the whole of possible categories assigned to *que* and *qui* in the following table:

Noun builder	
N/(S/N)	*J'aime qui tu aimes*
N/(S\N)	*Qui vivra verra*
Modifier builder	
(N\N)/(S/N)	*La femme que tu vois est ma sœur*
(N\N)/(S\N)	*La femme qui vient est ma soeur*

Table 1 : table of categories of the syntactic types of the relative clauses.

Noun builder	
N/S	*J'aime que tu viennes*
Modifier builder	
(N\N)/S	*L'espoir que tu viennes me réjouit*

Table 2 : table of categories of the syntactic types of the completive clauses.

Let us now deal with certain analysis (many other examples have been processed)

a) L'officier, qui donne les ordres, a déposé son fusil

1.	[N/N:l'] - [N:officier] - [(N\N)/(S\N):*qui*] - [(S\N)/N:*donne*] - [N: (les ordres)] - [(S\N)/(S\N):a] - [(S\N)/N:déposé] - [N: (son fusil)]	
2.	[N/N:l'] - [N:officier] - [(N\N)/N: (**B** qui donne)] - [N: (les ordres)] - [(S\N)/(S\N):a] - [(S\N)/N:déposé] - [N: (son fusil)]	**(>B)**
3.	[N/N:l'] - [N:officier] - [N\N : ((**B** qui donne) (les ordres))] - [(S\N)/(S\N):a] - [(S\N)/N:déposé] - [N: (son fusil)]	**(>)**
4.	[N/N:l'] - [N : (((**B** qui donne) (les ordres)) officier)]- [(S\N)/(S\N):a] - [(S\N)/N:déposé] - [N: (son fusil)]	**(<)**
5.	[N: (l' (((**B** qui donne) (les ordres)) officier))]- [(S\N)/(S\N):a] - [(S\N)/N:déposé] - [N: (son fusil)]	**(>)**
6.	[S/(S\N) : (**C*** (l' (((**B** qui donne) (les ordres)) officier)))]- [(S\N)/(S\N):a] - [(S\N)/N:déposé] - [N: (son fusil)]	**(>T)**
7.	[S/(S\N) : (**B** (**C*** (l' (((**B** qui donne) (les ordres)) officier))) a)] - [(S\N)/N:déposé] - [N: (son fusil)]	**(>B)**
8.	[S/N : (**B** (**B** (**C*** (l' (((**B** qui donne) (les ordres)) officier))) a) déposé)] - [N: (son fusil)]	**(>B)**
9.	[S : ((**B** (**B** (**C*** (l' (((**B** qui donne) (les ordres)) officier))) a) déposé) (son fusil))]	**(>)**
10.	((**B** (**B** (**C*** (l' (((**B** qui donne) (les ordres)) officier))) a) déposé) (son fusil))	
11.	(**B** (**C*** (l' (((**B** qui donne) (les ordres)) officier))) a) (déposé (son fusil))	**B**
12.	(**C*** (l' (((**B** qui donne) (les ordres)) officier))) (a (déposé (son fusil)))	**B**
13.	(a (déposé (son fusil))) (l' (((**B** qui donne) (les ordres)) officier))	**C***
14.	(a (déposé (son fusil))) (l' ((qui (donne (les ordres))) officier))	**B**

b) Qui vivra verra

1.	[N/(S\N) :qui] - [S\N : vivra] - [S\N : verra]	
2.	[N : (qui vivra)] - [S\N : verra]	**(>)**
3.	[S : (verra (qui vivra))]	**(>)**
4.	(verra (qui vivra))	

*c) Heureux **qui** frissonne aux miracles de cette poésie*

1.	[N/N:heureux] - [N/(S\N):qui] - [S\N:frissonne] - [((S\N)\(S\N))/N:aux] - [N:miracles] - [(N\N)/N:de] - [N/N:cette] - [N:poésie]	
2.	[N/N:heureux] - [N/(S\N):qui] - [S\N:frissonne] - [((S\N)\(S\N))/N:aux] - [N:miracles] - [(N\N)/N:de] - [N : (cette poésie)]	**(>)**
3.	[N/N:heureux] - [N/(S\N):qui] - [S\N:frissonne] - [((S\N)\(S\N))/N:aux] - [N:miracles] - [N\N : (de (cette poésie))]	**(>)**
4.	[N/N:heureux] - [N/(S\N):qui] - [S\N:frissonne] - [((S\N)\(S\N))/N:aux] - [N : ((de (cette poésie)) miracles)]	**(<)**
5.	[N/N:heureux] - [N/(S\N):qui] - [S\N:frissonne] - [(S\N)\(S\N) : (aux ((de (cette poésie)) miracles))]	**(>)**
6.	[N/N:heureux] - [N/(S\N):qui] - [S\N : ((aux ((de (cette poésie)) miracles)) frissonne)]	**(<)**
7.	[N/(S\N) : (**B** heureux qui)] - [S\N : ((aux ((de (cette poésie)) miracles)) frissonne)]	**(>B)**
8.	[N : ((**B** heureux qui) ((aux ((de (cette poésie)) miracles)) frissonne))]	**(>)**
9.	((**B** heureux qui) ((aux ((de (cette poésie)) miracles)) frissonne))	
10.	(heureux (qui ((aux ((de (cette poésie)) miracles)) frissonne)))	**B**

*d) Pierre entend le voisin **qui** chante*

1.	[N:pierre] - [(S\N)/N:entend] - [N/N:le] - [N:voisin] - [(N\N)/(S\N):qui] - [S\N:chante]	
2.	[S/(S\N) : (**C*** Pierre)] - [(S\N)/N:entend] - [N/N:le] - [N:voisin] - [(N\N)/(S\N):qui] - [S\N:chante]	**(>T)**
3.	[S/N : (**B** (**C*** Pierre) entend)] - [N/N:le] - [N:voisin] - [(N\N)/(S\N):qui] - [S\N:chante]	**(>B)**
4.	[S/N : (**B** (**B** (**C*** Pierre) entend) le)] - [N:voisin] - [(N\N)/(S\N):qui] - [S\N:chante]	**(>B)**
5.	[S/N : (**B** (**B** (**C*** Pierre) entend) le)] - [N:voisin] - [(N\N) : (qui chante)]	**(>)**
6.	[S/N : (**B** (**B** (**C*** Pierre) entend) le)] - [N : ((qui chante) voisin)]	**(<)**
7.	[S : ((**B** (**B** (**C*** Pierre) entend) le) ((qui chante) voisin))]	**(>)**
8.	((**B** (**B** (**C*** Pierre) entend) le) ((qui chante) voisin))	
9.	(**B** (**C*** Pierre) entend) (le ((qui chante) voisin))	**B**
10.	(**C*** Pierre) (entend (le ((qui chante) voisin)))	**B**
11.	((entend ((qui chante) (le voisin))) pierre)	**C***

e) J'aime que tu viennes

1.	[N : Je] – [(S\N)/N : aime] - [N/S : que] – [N : tu] - [(S\N) : viennes]	
2.	[S/(S\N) : (**C*** Je)] – [(S\N)/N : aime] - [N/S : que] – [N : tu] - [(S\N) : viennes]	**(>T)**
3.	[S/N : (**B** (**C*** Je) aime)] - [N/S : que] – [N : tu] - [(S\N) : viennes]	**(>B)**
4.	[S/S : (**B** (**B** (**C*** Je) aime) que)] – [N : tu] - [(S\N) : viennes]	**(>B)**
5.	[S/S : (**B** (**B** (**C*** Je) aime) que)] – [S : (viennes tu)]	**(<)**
6.	[S : ((**B** (**B** (**C*** Je) aime) que) (viennes tu))]	**(>)**
7.	((**B** (**B** (**C*** Je) aime) que) (viennes tu))	
8.	(**B** (**C*** Je) aime) (que (viennes tu))	**B**
9.	(**C*** Je) (aime (que (viennes tu)))	**B**
10.	((aime (que (viennes tu))) Je)	**C***

Conclusion

The classification and the analysis of relative, completive and indirect interrogative propositions in French by means of Applicative and Combinatory Categorial Grammar (ACCG) make it possible to simplify the models treating of the propositions and to highlight the mechanisms used in the French language such as the use of the functions. The French language applies its system of function to the system of the propositions. It can thus create the major part of the sentences with a limited set of functions: subject, direct object, indirect object, attribute... The emphasis put on that relative, completive and indirect interrogative propositions are divided, in fact, in a binary system ("builders" of nouns and "builders" of modifiers), we highlight that the language integrates propositions as complex as relative, completive and indirect interrogative propositions in its system of the parts of speech in order to support the integration of these syntagms formed in a complex sentence. Such an analysis has the merit to simplify the syntactic model while emphasizing the common elements of the language. The traditional classification of the relative, completive and indirect interrogative propositions results from a confusion between syntax and semantics. The ACCG makes it possible to carry out a classification of the syntactic units which emphasizes the syntactic structure of the French language making it possible to work out thereafter a modeling on three levels: phenotype, genotype, cognitive representation. The present study was limited to the analysis of *qui* and *que* in French. The results of the analysis are however promising. Next studies on the relative, completive and indirect interrogative propositions in French could be broader and could relate to other propositions, such as those introduced by *dont*, *auquel*, *comment*, etc.

References

Biskri, I., Delisle, S., 1999, Les Grammaires Catégorielles pour le développement d'applications multilingues destinées au WEB, *Revue BULAG, Numéro spécial sur le Génie Linguistique et le Génie Informatique*, Besançon, France.

Biskri, I., Desclés, J.P., 1997, Applicative and Combinatory Categorial Grammar (from syntax to functional semantics). *In Recent Advances in Natural Language Processing*, 71-84. John Benjamins Publishing Company.

Curry, B. H., Feys, R., 1958. *Combinatory logic* , Vol. I, North-Holland.

Desclés, J.P., 1996. Cognitive and Applicative Grammar: an Overview. *in C. Martin Vide, ed. Lenguajes Naturales y Lenguajes Formales, XII*, Universitat Rovra i Virgili. , 29-60.

Desclés, J. P, 1990. *Langages applicatifs, langues naturelles et cognition*, Hermes, Paris.

Dowty, D., 2000, The Dual Analysis of Adjuncts/Complements in Categorial Grammar. *In Linguistics 17*.

Girard, G., 2001, Les fausses interrogatives. *In proceedings of the conference Sémantique Syntaxe et Linguistique Anglaises*. Paris

Moorgat, M., 1997. Categorial Type Logics. *In Johan Van Benthem and Alice Ter Meulen eds.*, Handbook of Logic and Language, 93-177. Amsterdam: North Holland.

Morrill, G., 1994, *Type-Logical Grammar*. Dordrecht: Kluwer.

Shaumyan, S. K., 1998. Two Paradigms Of Linguistics: The Semiotic Versus Non-Semiotic Paradigm. *In Web Journal of Formal, Computational and Cognitive Linguistics.*

Steedman, M., 2000. *The Syntactic Process*, MIT Press/Bradford Books.