DISCUSSION OF FRED W. HOUSEHOLDER'S PAPER
"ANALYSIS, SYNTHESIS AND IMPROVISATION"



*Maurice Gross*

"Simple Sentences"

University of Paris 7

The thesis that will be developed here is that the representation of texts in terms of words is inadequate, and that the usual notion of lexicon has no obvious linguistic meaning. We will argue that the smallest unit of meaning is the simple sentence. We consider that localization of meaning into words, a concept taken for granted by many linguists, is not a plausible hypothesis. Grammarians have often raised the question about prepositions and cases : Are these items semantically empty or not ? We extend this question to words such as verbs and nouns that have always been considered as carriers of meaning.

Various reasons have led us to construct a lexicon-grammar of French (Gross 1980), that is, to represent the simple sentences of French according to their syntactic properties. A simple sentence (e.g. in English or in French) is a sentence with subject, verb, and possibly one or two objects. Other complements (place, time, manner, etc.) are excluded in general.

We will present general patterns that provide a basis for the analysis of complex sentences and discourses. We will constantly refer to the construction made for French, but the main features should not be essentially different in other Indo-European languages.[1]

1. THE LEXICON-GRAMMAR OF FRENCH VERBS.

We will write $\underline{N_0}$ for the subject, $\underline{N_1}$, $\underline{N_2}$ for the complements. The object sequence (noted $\Omega$) consists of zero, one or two of the three main prepositional phrases of French : <u>NP</u>, <u>à NP</u>, <u>de NP</u>. Objects answer the respective interrogative pronouns <u>(que + qui)</u>, <u>à(qui + quoi)</u>, <u>de(qui + quoi)</u>. In table 1, we enumerate the <u>a priori</u> combinations of up to two objects ; to the right of each structure, we give an order of magnitude of the number of verbs that enter into it. About 8,000 common verbs and their object complements have been described[2] in this way.

| | |
|---|---|
| $N_0$ V | 1,200 |
| $N_0$ V $N_1$ | 3,000 |
| $N_0$ V à$N_1$ | 300 |
| $N_0$ V de$N_1$ | 300 |
| $N_0$ V $N_1$ $N_2$ | 100 |
| $N_0$ V $N_1$ à$N_2$ | 1,600 |
| $N_0$ V $N_1$ de $N_2$ | 1,300 |
| $N_0$ V à$N_1$ à $N_2$ | 3 |
| $N_0$ V à$N_1$ de $N_2$ | 10 |
| $N_0$ V de $N_1$ de $N_2$ | 1? |
| | 7,800 |

Table 1

These types have been subdivided according to other criteria as well. Thus, the possibility of sentential $N_i$'s ($i$ = 0,1,2) and the possibility of accepting certain object-like place adverbials lead us to build a system of about 50 classes. In each class, the distribution of other syntactic properties such as passive, extraposition, etc. is indicated by a "+" or a "-" mark.

Altogether, the distribution of about 400 syntactic properties of verbs have been represented in this way (cf. annex). Other properties are being added. The properties that are essentially missing are the distributional ones, that is, the semantic characters, for which no well-founded means of representation is available.

2. THE LEXICON-GRAMMAR OF PREDICATIVE NOUNS

There exist many nouns which are intuitively close to verbs. With nominalizations, this intuition has formal counterparts : for example, participation being a nominalization of to participate,

it will share various properties with the verb. But it is harder to make explicit that nouns such as foreword or role should be considered as predicative or verbal. The terminology then appears to mirror some semantic property seldom discussed in syntax so far.

Following Harris 1964, we will call these nouns predicative, and we will distinguish them from simple nouns, such as the concrete noun ashtray which does not appear to convey this intuition, at least not in an obvious way.

Often, predicative nouns take complements analogous to verb complements, while this is not the case with simple nouns :
-object-like complements, as in

Joe's foreword to the book (surprised me)

and it seems to be an accident that there is no verb to foreword built on the model of

Joe prefaced the book

- place and time complements, as in

His role in Iran in 1952 (was crucial)

We will return to the analysis of these noun phrases.

According to our initial hypothesis, nouns have no meaning as such, they have to be considered within sentences.

First, we notice that this assumption has an immediate experimental consequence : judgements of acceptability have to be exercised on full sentences, and not on noun phrases, as is often done in generative grammar. Thus, asserting that the sequence

(1) the dream that Max would be freed

is acceptable or not is meaningless, since the answer depends on the verb to which this NP is attached :

(2) I had the dream that Max would be freed

(3)*I described the dream that Max would be freed

The restriction of occurrence of the phrase is not distributional, for both verbs are compatible with the direct object dream :

I described my dream

We have just observed two basic types of combinations between verbs and nouns : (3) and (2) differ by the fact that the verb to have does not carry any semantic load in the interpretation

of (2), it simply carries the tense ; its grammatical subject is in fact the subject of dream. Such verbs will be called support verbs (Vsup).

Returning to our hypothesis, we have to consider nouns within sentences. We have then to raise the following question : in order to evidence the characteristic properties of nouns, which verb(s) should be selected among the numerous ones which, a priori, can combine with a given noun ? Our program is then the following : given a predicative noun, find a support verb or an equivalence class of support verbs that combine with it, and that will account for the properties of the noun in combination with other verbs. For example, the noun present will have to make as a support verb :

Max made a present to Joe

The complement to Joe is found in other sentence types, such as :

Bob described Max's present to Joe

Motivations in favour of this program are multiple :

2.1 Nominalizations

Lees 1960 and Chomsky 1969 have looked at nominalizations of verbs as if they were transformations operating on ONE SENTENCE and leading to ONE NOUN PHRASE. Instead, we follow Harris 1964 and we study nominalizations as relations (transformations) between TWO SENTENCES. Thus, let the verbal sentence be :

$N_0$ V$\Omega$

we write V-n (V with suffix -n) for the derived noun. We have to look for a sentence form involving $N_0$, V-n, and $\Omega$, with possible restrictions on $N_0$ and $\Omega$. For example, we will pose the relations

$N_0$ V $N_1$ = : Max complimented Bob

= $N_0$ make V-n to $N_1$ =: Max made a compliment to Bob

and also

$N_0$ V$\Omega$ = : Max walked in the garden

= $N_0$ take V-n$\Omega$' =: Max took a quick walk in the garden

$\Omega$ must not include the complement quickly associated to quick in similar forms (Harris 1976).

Such relations hinge on the existence of verbs like to make, to take used in such a way that they do not introduce any meaning (other than aspectual) with respect to the verbal sentences.

Also, it is possible to maintain that $N_0$ is still the "subject" of the derived V-n. We will also call to make and to take support verbs. Other examples of support verbs in English are presumably : to bear, in

Max accused Lou = Max bore an accusation against Lou

to be in, in

This result contradicts your claim

= This result is in contradiction with your claim

Max loves Lou

= Max is in love with Lou

to have, in nominalization of adjectives

Max is ambitious

= Max has a certain ambition

to be of, in

= Max is of a certain ambition

The same Vsup are also found in combination with non-derived nouns, as in

Max is in a position to succeed

This clam has a certain weight

= This clam is of a certain weight

It is not known to what extent these constructions are general in English[3]. Only large-scale lexical studies can demonstrate the existence of derivational relations such as those just mentioned. We suggested the preceding examples of Vsup on the basis of the studies performed on French :

- Giry-Schneider 1978a has studied about 2.000 pairs with Vsup =: faire :

Max rêve = Max fait des rêves

Max complimente Bob = Max fait des compliments à Bob

- de Negroni-Peyre 1978 is a first study of Vsup =: être en, bearing on about 250 pairs of the types

Ce résultat contredit votre assertion

= Ce résultat est en contradiction avec votre assertion

The completed study should involve over 1,000 pairs ;
- Meunier 1977 deals with more than 500 pairs or triples such as

Max est tuberculeux = Max a la tuberculose
Max est (ambitieux + féroce)
= Max a (de l'ambition + une certaine férocité)
= Max est d'une certaine (ambition + férocité)

Close to 2,000 analogous sets have been described[4].

There are limitations on these nominalization phenomena : for a given S =: $N_0$ VΩ and an associated V-n, we do not know whether it is always possible to find a Vsup that will lead to an accepted pair constituting a transformational relation. In the same way, we do not know whether, for any noun felt as predicative, it will be possible to find a Vsup. An example of this limitation is perhaps given by passive nominalizations such as

(4) The transformation of the equation by Max (led to a new solution)

There have been proposals to relate it to the passive form of the verbal sentence

(5) Max transformed the equation

but in our framework, we would first establish a nominalization relation with

(6) Max (?made + gave) a transformation of the equation

and then passivize (6) into

(7) A transformation of the equation was (made + given) by Max

A further operation of embedding would reduce the Vsup of (7), leading to sentences such as (4). As can be seen from (6), several questions have to be asked :
-Have we found a satisfactory Vsup ? If neither to make nor to give determines a nominalization relation, can some other verb be found?
-Have we found two Vsups ? If yes, do we have to distinguish one of them as basic, or else should we attempt to construct an equivalence class of Vsups ?
In order to investigate the set of possible Vsups, one may be able to use syntactic arguments :

(i) Consider the sentence

Max proceeded to the transformation of the equation

The verb to proceed possesses the characteristics of a Vsup : essentially, Max is the subject of transformation ; but this sentence has no passive form :

*The transformation of the equation was proceeded to by Max



thus, the form in (4) cannot be reached from it.

(ii) Consider the relation

Max hates Bob ferociously
= Max has a ferocious hatred for Bob

The relation introduces the preposition for which is found in sentences such as

(I heard about) Max's ferocious hatred for Bob

Notice that the fact that the Vsup to have has no passive can be linked to the unacceptability of forms such as

*(I heard about) the hatred of Bob by Max

that are the equivalent of (4). But the sentence

Max dedicated a ferocious hatred to Bob

could also be part of the relation of nominalization ; to dedicate has properties quite similar to those of to have. We will have to distinguish these two cases, since the sentence form with preposition to is unacceptable :

*(I heard about) Max's hatred to Bob

There are other questions that arise in a systematic research of Vsups . At any rate, the study of French has shown that in a large number of cases, it was possible to find at least one satisfactory Vsup, and in many situations, a particular Vsup stood out clearly.

2.2 Non-derived nouns

Another reason for introducing Vsups is the syntactic and semantic analogy between the V-ns just discussed and certain nouns that are not connected to verbs or to adjectives. Consider for example the sentences

Max had a dream about his next job
Max had a nightmare about his next job

they have the same syntactic properties, for example with respect to clefting :

It is about his next job that Max had a (dream + nightmare)

they correspond to the same noun phrases in

Max described his (dream + nightmare) about his next job

but here, the about complement cannot he clefted :

*It is about his next joh that Max described his (dream + nightmare)

The N nightmare is not morphologically linked to a verb or to an adjective. The same is true for row in[5]

Max made a row about your decision

which is similar to

Max made a fuss about your decision
= Max fussed about your decision

The observed parallelism leads us to conclude that it is the same Vsup to have that supports both dream and nightmare, and that it is the same Vsup to make which accompanies row and fuss. We gave other examples of this situation above in 2.1. Again, studies on French (Gross 1975, Labelle 1976, Giry-Schneider 1978a) indicate that it is possible to find a Vsup for most non-derived predicative nouns and, as mentioned, this Vsup is also observed in a nominalization relation.

2.3 Combinations of verbs and predicative nouns

Various patterns of combinations can be observed. Consider the NP

the transformation of the equation

The following are possible combinations :

(8) I (performed + undertook) the transformation of the equation

(9) I laughed at Max's transformation of the equation

(10) Max's transformation of the equation surprised me

In (8), with to perform, to undertake, I is the subject of transformation, and this must be the case : the two sentences

(11) I (performed + undertook) Max's transformation of the equation

are not accepted in the same way as (9) and (10). If they are accepted at all, Max is not interpreted as the subject of transformation, hut as the inventor of (an advocate of, etc.)

the transformation, and I is still the subject. The situation is sharply different with to laugh and to surprise in (9) and (10), where Max has to be the subject of transformation and I has no relationship to the NP transformation of the equation.

Thus, there appear to exist two basic types of behavior for verb - noun combinations. One is the Vsup type, the other involves the embedding of an NP into a subject or a complement position. The situation of 2.2, where two types of verbs were opposed with respect to clefting, correlates with this distinction (Gross 1976).

Some of the verbs that extend the Vsups have some meaning of their own, we have for example a common paradigm such as

Max has a certain courage
Max keeps his courage
Max loses his courage
Max develops a certain courage
Max nurtures a certain hatred for Eva

Since the possessive his must refer to the subject Max, we can also consider that in all these cases, Max is the subject of courage[6] and hatred. More complex examples are found, such as

His advice helped me in the transformation of the equation
*His advice helped me in Max's transformation of the equation

where me is the subject of transformation, while in

Lou taught me Max's transformation of the equation

me is not related to the object NP. Other complex patterns are described in Gross 1980 and semantic interpretations are discussed in Giry-Schneider 1978b.

3. CLASSIFICATION OF NOUNS

In our framework, where lexical items have to be considered within sentences, we have proposed a solution for predicative nouns. With simple concrete nouns such as ashtray, it is not clear what kind of sentence may constitute an entry. There exist however sentences that could be distinguished for this purpose. Consider

An ashtray is a container
A hand has five fingers, etc.

Some of these sentences have been called analytical by philosophers of language. They can be viewed as tautological in some sense, we will simply say that they are not informative, at first

sight. In fact, they provide the implicit part of the description of the Universe shared by most speakers of the corresponding language. They are opposed to sentences that are syntactically identical, such as

An ashtray is a weapon (in Bob's hands)

and that are used in particular circumstances. The function of this latter type of sentence is to communicate information which, a priori, is not shared by all speakers.

We now recall that there exist special verb-noun combinations that could be used to describe the more general combinations that are currently named distributions of nouns with respect to a verb. The combinations we refer to are highly restricted distributions, such as that of N in the form

He glued the broken plate with N

The position of N can only be occupied by the noun glue, a synonym, a brand name of glue, as in

He glued the broken plate with (instant glue, Scotch Mix, etc.)

N =: glue identical to the main verb is called an internal noun. This situation can be extended to Ns that are not morphologically related to the verb, cognate nouns as in

He eats food

Before proposing a way of constructing the combinations verb-nouns (Harris 1968,1976), we briefly recall the solution of generative grammar. Generative grammar uses imprecise context-sensitive rules to introduce Ns that have been classified according to semantic features : only verbs and nouns carrying matching features can thus be combined. This solution has no empirical basis ; for example, there has not been a single study on the possibilities of combination of one (or more) verb with a number of nouns that would come close to the effective lexical possibilities. Nobody has provided a description that would go beyond the trivial, that is beyond isolated examples of sentences. Moreover, the process by which features are determined appears to be circular. For example, the object of the verb to eat will be marked / + food/, the object of to cook is /+ cookable/, the object of to hunt is /+ huntable/, etc. The only non-intuitive control

the linguist has in the definition of a feature is the formal derivation with suffix -able[7], which conflicts with the intended abstract character of the notion of feature. This way of proceeding indicates that features cannot be fundamentally different from internal nouns.



We now outline a process of description for distributions of nouns that does not make use of features. Consider

(1) A person sings a song

This sentence is considered as a fixed form composed of a verb, its internal subject person and an internal object song. We should perhaps instead consider

(2) A singer sings a song

However, internal subjects such as singer often carry the aspectual meaning "professional" (opposed to "occasional") which might be too restrictive. Notice that (2) does not trigger an intuition of double pleonasm as it should, since the same lexical item is repeated three times. Rather, we understand (2) as defining one term by means of the two others ; the lack of information in (2) gives it a status close to the status of analytic sentence as seen above.

We also consider sentences such as

An aria is a song
An anthem is a song, etc.
Frère Jacques is a song, etc.

They classify types of songs, names of songs that are clearly connected to what has been called the distribution of the object of to sing. In the same way, we use the sentences

Max is a person
A boy is a person, etc.

that classify human nouns. These sentences with to be are analytical or not. We now combine (1) with these classificatory sentences by relativization :

The person who is Max sings the song which is Frère Jacques

To this form, we apply WH-IS deletion and a zeroing process that eliminates the redundant information constituted by the internal nouns. We then obtain

Max sings Frère Jacques

This computation provides the same sentences that are obtained in generative grammar by means of rules of selection and semantic features.

We think that the solution with internal nouns has several advantages over the generative solution. We advocated elsewhere the use of a concrete approach in replacement of the abstract approach of generative grammar (Gross 1979). We take the same stand with respect to semantic features.

Features open an indefinite number of formal possibilities that do not appear to have any empirical significance :

- first, why should features be binary ? Why should they not be marks ?
- for example, the object of a verb has to be marked with the features shared by all the nouns of the corresponding distribution. Independently, nouns are marked with their own features. Compatibility rules must apply to ensure that verb and noun features match properly. In contrast, no duplication of features and no rules of compatibility are needed in the fixed sentence approach ;
- rules of redundancy are necessary in a feature system : for example, a food noun is concrete and non human. This has to be expressed by a rule such as

[+ food] → [+ concrete, -human]

The nature and the interest of a calculus based on these rules are not selfevident, although some individuals may find it intuitively rewarding to construct a universal semantic system of this type. The concrete solution may require an equivalent activity when it comes to classifying the nouns of a lexicon, but this activity is not considered as a part of linguistic theory. At any rate, the procedures will mainly involve observables : sentential relations between nouns and between verbs and nouns.

One could argue that the process of distinguishing an internal noun is just as circular as the determination of a feature. There is however an important difference in favor of internal nouns : abstract elements may be necessary, but only after one has made sure that existing terms cannot serve the purpose. Internal nouns constitute a reality with which actual examples can be confronted ; for example, when one tests the semantic

inclusion of a noun into another, one checks an actual sentence. Instead, with features, a noun is not compared to another noun, but to a feature, that is to a pure intuition ; even worse, bundles of features, i.e., mixtures of intuitions, are compared, and this is done without the benefit of the formal framework provided by sentences where the verb to be links two nouns.



4. SENTENCES WITH FROZEN PARTS

The following sentences have a frozen part :

(1) Max took the bull by the horns
(2) Max kicked the bucket
(3) Max beats his brain out over the question
(4) Bob cut the ground from under Max's feet
(5) Max has twisted Bob around his little finger
(6) Bob's knees knocked together

In (1), (2) and (5), the complement sequence, prepositional or not, is frozen. In (3) and (4), one of the complements is frozen, the other is free. In (6), the subject is frozen.

The traditional definition provides an operational way of recognizing these sentences : roughly, when the verb and the fixed NPs do not contribute to the meaning of the sentence, it is said to be frozen. We will oppose frozen sentences to free sentences. Free sentences have productive distributions in their NPs. In a frozen sentence, one of the NPs at least cannot be commuted without a radical change of meaning.

In most cases, both the verbs and the fixed nouns have a meaning in other contexts, but these meanings are synchronically unrelated to the meaning of frozen sentences. In example (1), to take, bull and horns cannot be used to construct the meaning, and the proper meaning is no longer related to the meaning of the idiom.

Frozen sentences are in general well-formed ; namely, they obey practically all grammatical constraints (e.g. word order, nature and place of determiners, of tenses, of modifiers, etc) Some of these sentences are frozen with respect to transformations, others are not :

[passive] (2) = *The bucket was kicked by Max
[passive] (5) = Bob has been twisted around Max's little finger

In this last example, we notice that the possessive adjective of

(5) has been replaced by its semantic source : Max. This situation is unusual, because in (5) the possessive adjective had no attested source :

*Max has twisted Bob around Lou's little finger

it is obligatorily coreferent to the subject :

*Max has twisted Bob around your little finger

Given a transformation, or any linguistic property of a free sentence, we have been able to find frozen sentences that accept the transformation or the property. Thus, in a sense, frozen sentences undergo transformations in the same way as free sentences do : All transformations of free sentences have exceptions ; in other terms, they apply to certain verbs (simple sentences) and not to others. We found the same situation with the frozen sentences of French; the only difference with free sentences is statistical : transformations apply more often to free sentences than to frozen ones. Thus, regular syntactic analysis applies to frozen sentences, but syntax is irrelevant to the determination of the frozen parts. As far as learning goes, both meaning and word shape have to be learned by heart[8].

We now provide numerical data that show the lexical importance of the phenomenon in French. Analogous data have not been assembled so far in English.

We will note structures in the following way :

$N_0$ V $N_1$ Prep $N_2$ is the structure of a free form.

When a syntactic position is frozen, it is noted $C_i$ instead of $N_i$ ; we write more explicitly the content of an $N_i$ or of a $C_i$ between parentheses indexed by $i$ :

($_0$C de N) means that the subject is composed of a frozen head C that has a noun complement introduced by the preposition de (of), as in ($_0$Les dents de Bob) s'entrechoquent, a translation of (6).

The following table gives orders of magnitude for the various types of frozen sentences that have been classfied :

| | |
|---|---|
| $C_o$ V$\Omega$ | 400 |
| $N_o$ V $C_1$ | 1,800 |
| $N_o$V Prep $C_1$ : Max joue sur du velours | 900 |
| $N_o$V($_1$C de N):de ≡ à:Max casse les pieds (de,à)Bob | 400 |
| $N_o$V($_1$C de N):de ≢ à:Max a percé le secret de Bob | 200 |
| $N_o$V($_1$Prep C de N) :Max marche sur le corps de Luc | 200 |
| $N_o$V $C_1$ Prep $N_2$ : cf. example (5) | 1,300 |
| $N_o$ V $N_1$ Prep $C_2$: cf. example (4) | 900 |
| $N_o$ V $C_1$ Prep $C_2$: cf. example (1) | 600 |
| $N_o$V$\Omega$ : the variable $\Omega$ contains other frozen parts | 700 |

Table 2

Table 2 only corresponds to verbs different from the Vsup's être (to be) (Danlos 1980), avoir (to have), faire (to do, to make), and from other verbs close to Vsups that enter into several thousands sentences intermediate between frozen sentences and sentences with Vsups . In any case, we are entitled to compare the figures of both tables 1 and 2 :

- semantically,free or frozen sentences are predicates of the same type ; often a frozen sentence can be paraphrased by a free one ;
- we also found an empirical limit of two complements for frozen sentences ; frozen adverbs exist and can be used to increase the length of $\Omega$, but they have different semantic properties ;
- frozen forms include prepositional phrases with Prep ≠ à, de (cf. 1) ; in general, these phrases are obligatory in the sentence. Phrases of similar forms are often optional and not counted as objects in free sentences.

There are other problems raised in connection with the counting of simple sentences, but one fact stands out clearly : when counted in comparable ways, there are more frozen sentences than free ones. This observation has theoretical consequences that we will discuss elsewhere.

ANNEX

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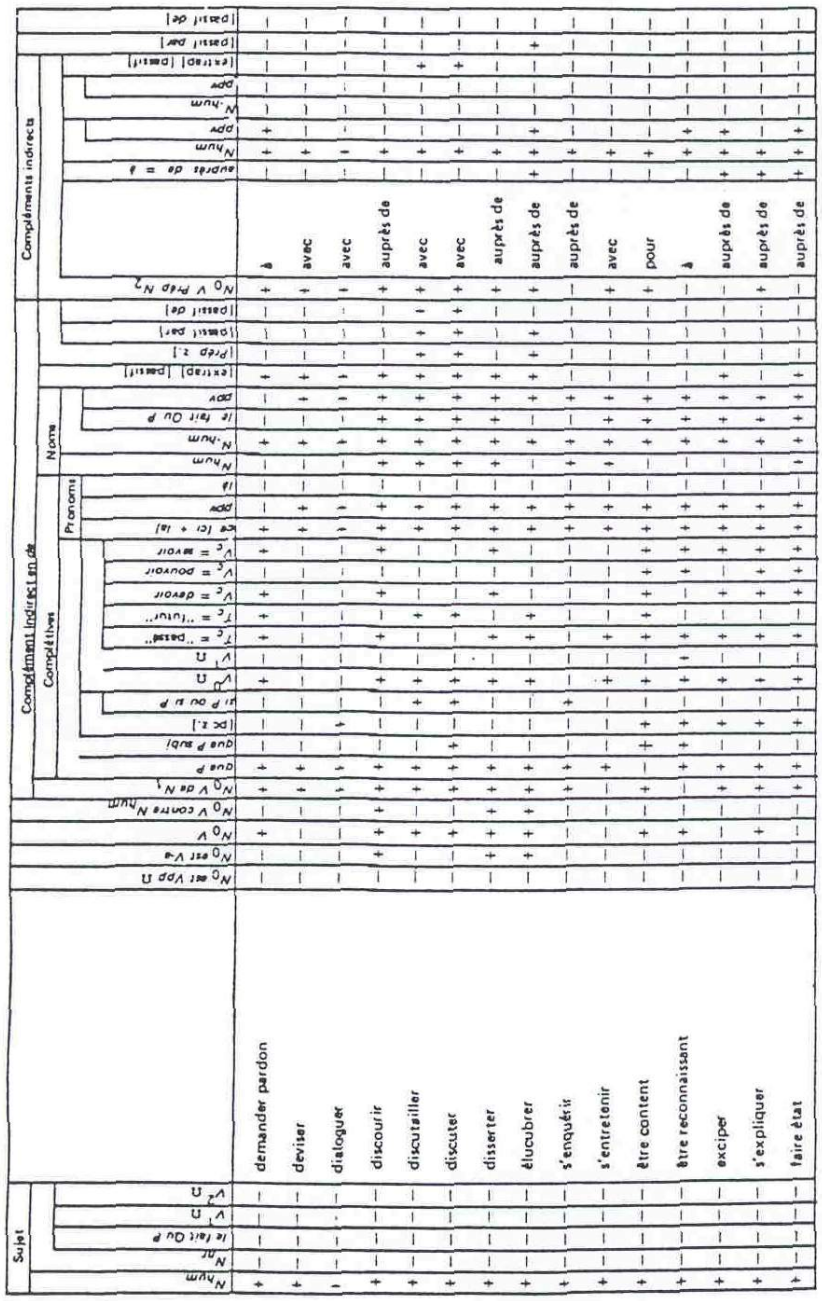

(From Gross 1975)

## NOTES

E.R.A. 247 du C.N.R.S., associated to the Universities Paris 7 and Paris 8.

1. Lexicon-grammars of Italian (Elia 1978, 1979), Portuguese (Malaca Casteleiro 1978, Maceido 1979), Spanish (Subirats, forthcoming) are being constructed. There exist preliminary studies on German (Treig 1977), Korean (Hong Chai-Song, forthcoming), Malagasy (Rabenilaina 1979). F.W. Householder et alii 1964-5 and Chapin 1967 are studies of a related type.

2. Boons, Guillet, Leclère 1976a, b, 1981 ; Gross 1975.

3. Cf. Live 1969, for a suggestive study on to make.

4. These data are in the form of computer printouts, available on request.

5. There are other meanings of row and to row.

6. Instead of considering extensions of Vsups, one might attempt to analyze further some of these examples with the idea that they could be reduced to one basic Vsup : to have. Such an analysis would then involve

   Max has lost the courage he had

   where he must refer to Max :

   *Max has lost the courage you had

7. This procedure is limited to certain object positions.

8. Notice also that frozen expressions cannot be considered as imposing selectional restrictions on their free NPs ; Vsups cannot introduce selectional constraints either. Thus, the very notion of selectional restriction (Chomsky 1965) appears to be unrelated to the meaning of the words in the context, and has to be linked with some unclear notion of meaning.

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