

LE PESANT Denis. 2003. « Principles for a Semantic Classification of Verb Predicates ». *Language Research*, Special Issue, December 2003 : 21-38. Seoul : Language Education Institute, Seoul National University.

Denis Le Pesant
Laboratoire de Linguistique Informatique (CNRS & Paris XIII University)
Lille III University (France)

This article is an account of a work of building a whole *semantic classification of verb predicates* in French. We justify our theoretical standpoints, specially as regards the interface between semantics and syntax. The main syntactic criteria of classification of the verbs are : the properties of syntactic sub-categorisation (e.g. number of arguments, morpho-syntactic nature of arguments, selection of possible prepositions), the paraphrastic variants of the sentence (e.g. reduction of the number of arguments, diathesis or neutrality variants), the lexical semantics (mainly hierarchical relations between classes, and lexical selection by the predicate of object classes in argument position). Since we claim that the syntactic categories must be subsumed under semantic classes, every semantic class is shown to be defined by means of a cluster of typical syntactic properties. We illustrate our ideas with the example of verbs *locating an object in a section of space*.

verb predicates
semantic classification
syntactic properties
location verbs

Principles for a Semantic Classification of Verb Predicates

Introduction

This is an account of the work of a research team of the LLI¹ in charge of building a semantic classification of verb predicates in French. Let us start by enumerating the fundamental theoretical standpoints of the LLI.

Three of these theoretical standpoints are inherited from Zellig Harris² and the LADL³: first, making the predicate the head of the elementary sentence; second, lexicalism (most grammar rules are lexical rules)⁴; third, “surfacism” (the notion of deep structure is not used, no semantic nor logical level of representation is postulated and transformations are considered as *paraphrastic variants* of the sentence, the notions of movement and trace being excluded).

Two other theoretical standpoints are specific to the LLI (see, among other references, Gaston Gross, 1992 & 1994; Le Pesant & Mathieu-Colas eds. 1998) : giving the lexicon the form of a system of hierarchical *semantic classes*; and accounting for an essential semantic property, namely the phenomenon of *lexical selection* by the predicate of *argumental object classes*.

In this article, we will justify the theoretical standpoints of the LLI, specially as regards the interface between semantics and syntax, and we will illustrate our ideas with the example of verbs *locating an object in a section of space*.

¹ LLI : Laboratoire de Linguistique Informatique (= Laboratory of Computational Linguistics). Director : Gaston Gross.

² See, among other references, Harris, Z. (1976).

³ See, among other references, Maurice Gross (1975); Boons, Guillet & Leclère 1976; Guillet & Leclère 1992.

⁴ The LADL had a monopoly of the lexical approach for several years. This standpoint is now widespread: Categorical Grammars, Construction Grammars, Lexical Functional Grammars, HPSG (see Sag & Wasow 1999), TAG (see Abeillé 2002).

N<patient> être V-é adjectival passive voice⁵ (*Luc est ému* [“*Luc is moved*”])

- *neutrality* variants implying a *goal* (see infra Part 3)
 - (a) N(agent) V N (goal) *de* N(object to be located)
Luc a rempli ce récipient de mauvais vin. [“*Luc has filled this jug with bad wine*”]
 - (b) N(object to be located)>V N(goal)
Un mauvais vin remplit ce récipient [“*A bad wine fills this jug*”]
 - (c) N(goal) être V-é *de* N(object to be located)
Ce récipient est rempli d’un mauvais vin. [“*This jug is filled with a bad wine*”]
 - (d) N(goal) être V *par* N(agent) *de* N(object to be located)
Ce récipient a été rempli par Luc d’un mauvais vin.
[“*This jug has been filled by Luc with a bad wine*”]

Comments. (a) and (d) are linked by an active /passive diathesis; (a) and (b) are linked by a neutrality phenomenon specific to some *locative* verbs; (b) and (c) are linked by an active/passive diathesis.

1.3 Lexical semantics of predicative verbs

We do not limit our attempt at classifying verbs to recording syntactic properties. We also deal with the tasks of traditional semantics and we represent:

- hierarchical relations between classes (*hyperonyms* and *hyponyms*); separation of the different uses of *polysemous* words; separation of *terminological* uses, relations of *antonymy* and *synonymy*
- aspectual properties of predicates
- *object classes* selected in argument position by the predicate; the example of *locative* verbs which can be found in Part 4 of this article shows that taking this phenomenon into account enables us in many cases to subdivide lexical classes accurately.

1.4. Syntactic and semantic descriptions need to be factorised and organised into a system

We have just mentioned the large number and heterogeneity of syntactic phenomena. Now our aim is to make all the linguistic properties of each lexical unit explicit. In other words, the common factors to any class must be stated whenever possible and the description will be organized as a system.

2 Syntactic categories must be subsumed under semantic classes

What is to be done in order to join the representation of syntactic properties to that of semantic properties?

2.1 It is impossible to classify one or several complete semantic classes under one main syntactic category; on the other hand, it is always possible to list the different syntactic categories which can be found inside a complete semantic class

Experience shows that a syntactic class and a semantic class never are perfectly co-extensive. It is impossible to classify one or several complete semantic classes under a single syntactic category such as *verbs with dative complements* or *neutral verbs*. As regards classes established by the LADL, they are not defined in terms of a single syntactic property; they are certainly defined in terms of a

⁵ “Resultative passive” is also used.

collection of properties, but these are grouped according to a common syntactic property (such as the argument pattern *NO V que P*). The study of these classes shows that they do not have semantic coherence; and when now and then semantic sub-groups emerge, they hardly ever are complete semantic classes.

On the other hand it is always possible to list the different syntactic types which can be found in a given semantic class and in each of its sub-classes. Theoretically, there should not be any difficulty in correlating a specific syntactic description with each verb. In reality, experience shows that syntactic description, although constrained by the necessities of semantic description, can be factorised : it is possible to correlate a limited set of linguistic properties with any semantic class. We give an illustration of this in Part 3.

2.2 Generalities on the method of description of a semantic class : it is to be defined first *in extension*, then *in intension*

To define a class of elements of a certain type *in extension* is to list all the elements. If the class can be subdivided into a number of sub-classes, the elements are sorted out so that one can give a definition *in extension* of each of the sub-classes. To define it *in intension*, in a complementary approach, is to list the common properties.

As regards semantic lexical classes and sub-classes, their definition *in extension* comes under spontaneous linguistic competence; for example, any speaker of a given language is competent to spontaneously list a large number of verbs of *feeling*, *cognition*, *movement with a change of places*, *movement without a change of places*, of *changes in dimension*, *colour*, *shape*, etc. The definition *in intension* of a semantic class mainly consists in listing the syntactic properties (different syntactic types, particularly paraphrastic variants) and in making the lexical selection of arguments explicit (specification of the *object classes* selected in argument position).

3 The example of *locative verbs*

The example selected for our semantic description, necessarily much simplified, deals with some 600 *locative verbs*. They express the idea that *there is someone or something somewhere*.

Examples :

- (i) *Un corps gît sur le sol* ["A body is lying on the ground"]
- (ii) *Je répands des fleurs sur le sol # Des fleurs sont répandues sur le sol*
["I spread flowers on the ground" # "Flowers are spread on the ground"]
- (iii) *Je parsème le sol de fleurs* ["I scatter flowers on the ground"]
Des fleurs parsèment le sol ["Flowers are scattered on the ground"]
[literally "*Flowers scatter the ground"]
Le sol est parsemé de fleurs ["The ground is scattered with flowers"]
- (iv) *Une famille nombreuse occupe cet appartement* ["A large family occupies this flat"]
Cet appartement est occupé par une famille nombreuse.
["This flat is occupied by a large family"]
- (v) *Cet appartement abrite une famille nombreuse* ["This flat accommodates a large family"]

3.1 General properties of *locative verbs*

- *Locative verbs* have three general properties :
 - from an aspectual point of view, they are *stative verbs* or *state-causing verbs*

- depending on their status as *stative* or *state-causing* verbs, their hyperonymous structures are :

N0(object to be located) is V-ing PREP<locative> N1(goal)

N0(cause) puts N1 (object to be located) PREP<locative> N2 (goal)

in which :

Object to be located = <human, concrete>

Goal = <inanimate concrete>

PREP <locative> = *dans, sur, devant, loin de ...* [“in, on, in front of, far from” ...]

Cause = <human, natural force>

- they belong to one of the five syntactic types below :

(1) N0(object to be located) **V** PREP<loc> N1(goal)

*Un corps **gît** sur le sol* [“A body is lying on the ground”]

(2) N0(cause) **V** N1(object to be located) PREP<loc> N2(goal)

#N0(object to be located) être **V-é** PREP<loc> N1(goal)

*Je **répands** des fleurs sur le sol# Des fleurs sont **répandues** sur le sol*

[“I spread flowers on the ground # Flowers are spread on the ground”]

(3) N0(cause) **V** N1(goal) *de* N1(object to be located)

N0(object to be located) **V** N1(goal) # N0(goal) être **V-é** *de* N1(object to be located)

*Je **parseme** le sol de fleurs # Des fleurs **parsement** le sol # Le sol est **parsemé** de fleurs*

[“I scatter flowers on the ground” # literally “*Flowers scatter the ground”

“The ground is scattered with flowers”]

(4) N0(object to be located) **V** N1(goal)

*Une famille nombreuse **occupe** cet appartement* [“A large family occupies this flat”]

(5) N0(goal) **V** N1(object to be located)

*Cet appartement **abrite** une famille nombreuse.*

[“This flat accommodates a large family”]

• **Comments on the properties of locative verbs**

Patterns (1) and (2) are sentences with nominal complements in the locative case (which means that the Noun Phrase in that position can be commuted with the adverbs *où* [“where”] and *quelque part* [“somewhere”]).

Patterns (1), (4) and (5) obviously have *stative verbs*. They cannot be used with the progressive aspect auxiliary *être en train de*. In pattern (1), the verb has two arguments among which a locative complement. In pattern (2), the verbs have three arguments among which a locative complement. They can be conjugated in the following voices :

adjectival passive voice (*Des fleurs sont répandues sur le sol* [“flowers are spread on the ground”])

inchoative pronominal passive voice (*Des fleurs se répandent sur le sol*)

[“Flowers are spreading on the ground”]

causative active voice (*J’ai répandu des fleurs sur le sol* [“I have spread flowers on the ground”])

passive voice (*Des fleurs ont été répandues par moi sur le sol*)

[“Flowers have been spread by me on the ground”]

One can see that these verbs express *Accomplishments* in the *active voice* and *States* in the *adjectival passive voice*. Arguments based on the notion of *presupposition* prove that the active voice is

causative, which allows us to say that the *adjectival passive* voice constitutes the essential aspectual value of these verbs. That is why we name them *State-causing* verbs.

The verbs which subcategorize pattern (3) can also be characterized by the fact that they can be conjugated in the *adjectival passive* voice. This leads us to name them *State-causing* verbs too. These are the voices in which they can be conjugated :

adjectival passive voice (*Le sol est parsemé de feuilles* [“the ground is scattered with leaves”])
inchoative pronominal passive voice (*Le sol se parseme de feuilles*)
[“the ground is getting scattered with leaves”]
causative active voice (*Pierre/le vent a parsemé le sol de feuilles*)
[“Peter/the wind has scattered the ground with leaves”]
passive voice (*Le sol a été parsemé de feuilles par Pierre/le vent*)
[“The ground has been scattered with leaves by Peter/the wind”]
diathesis of the adjectival passive voice (*Une multitude de feuilles parsèment le sol*)
[“A large number of leaves are scattered on the ground”]
[literally “*A large number of leaves scatter the ground”]

The verbs belonging to category (3) have a noteworthy specificity : they allow the following alternation, which is an *adjectival passive/active* relation :

N0(goal) est V-é de N1(object to be located)
Le sol est parsemé d'une multitude de feuilles
[“The ground is scattered with a large number of leaves”]

N0(object to be located) V N1(goal)
Une multitude de feuilles parsèment le sol
[“A large number of leaves are scattered on the ground”]
[literally “*A large number of leaves scatter the ground”]

The difference in meaning effects between type (2) and type (3) has been much commented upon in generativist schools, following Anderson S.R. 1977, under the name of *holistic effect* : when the *goal* is used in the position of object complement (*Je parseme le sol de fleurs* [“I scatter the ground with flowers”]) the sentence presupposes the idea that its scope is the whole of the site; this presupposition is absent when the *goal* is in the position of locative complement (*je répands des fleurs sur le sol* [“I spread flowers on the ground”]).

In patterns (4) and (5), the verb is transitive; the two patterns are differentiated by the reverse order of the *object to be located* and the *goal* (*Mon cousin occupe mon appartement* vs *Mon appartement abrite mon cousin* [“My cousin occupies my flat vs My flat accommodates my cousin”]. Besides, transitive verbs belonging to category (5) cannot be passivized. (**Une famille nombreuse est abritée par cet appartement*; **deux litres d'huile sont contenus dans ce récipient* [“*A large family is accommodated by this flat; *two litres are contained in this jug”]).

Internal location (*à l'intérieur de, au milieu, en haut, en bas...* [“inside, in the middle of, on top, at the bottom”...]) and external location (*à la surface, au-dessus, devant...* [“on the surface, above, in front of”...]) can be expressed in two ways. In patterns (1) and (2), which have a locative complement, they are expressed by various locative prepositions. In the other patterns, these notions are part of the meaning of the verb : for instance, the hyperonyms of *couvrir* [“cover”] and *remplir* [“fill”] are respectively *mettre sur* [“put on”] and *mettre dans* [“put in”].

To conclude, we state that in spite of a variety of syntactic structures, locative verbs have a deep unity: they have the same hyperonyms (*être quelque part* [“be somewhere”] and *mettre qq/qqch quelque part* [“put so/sthg somewhere”]), and they have the same aspectual values (*stative* or *state-causing*). The latter point is crucial, since it enables us to distinguish between locative verbs and other verbs

with a locative complement which are very different from the semantic point of view and which refer to accomplishments or achievements: perception verbs (*voir qqch quelque part* [“see sthg somewhere”]), cognition verbs (*imaginer qqch quelque part* [“imagine sthg somewhere”]), prehension verbs (*cueillir qqch quelque part* [“pick sthg somewhere”]), verbs of movement (*envoyer qqch à qq quelque part* [“send sthg to so somewhere”]). Besides, the syntax of all those verbs is specific : the location complement is necessarily *optional* (which is not the case for all locative verbs) and most of them are verbs with secondary predication.

3.2 Principles for the subdivision of the class of *locative* verbs

For reasons which have been developed in Part 2, we will not use syntactic properties (1) to (5) as criteria for the subdivision of the class of *locative* verbs. It would not enable us to bring to the fore the narrow semantic relations which can be found between the two elements of such pairs as :

habiter dans (une maison) [“live in (a house)”]
vs *habiter* (une maison) [“inhabit (a house)”]

éparpiller (quelques objets sur le sol) [“scatter (a few objects on the ground)”]
vs *joncher* (le sol de quelques objets) [“strew (the ground with a few objects)”]

étaier (du beurre sur le poulet) [“spread (butter over the chicken)”]
vs *enduire* (le poulet de beurre) [“coat (the chicken with butter)”]

3.2.1 Syntactic categories are subsumed under semantic classes

The various semantic classes having been built and subdivided, each syntactic category from (1) to (5) is found to be represented several times in the whole category. For instance, category (3) belongs to verbs expressing the relation <massive soft/surface> (e.g. *Cette éponge est saturée d’huile* [“this sponge is saturated with oil”]) as well as to the verbs expressing the relation <hum-plural/territory> (e.g. *Cette région est peuplée d’agriculteurs* [“this region is populated by farmers”]).

3.2.2 Two important types of criterion for semantic classification

The first important type of criterion for semantic classification concerns the lexical selection of object classes in argument position, particularly that of the *object to be located* : human, discrete concrete (oriented vertically or not, with obligatory plural or not, collective or not, with internal, hollow or full location...), massive concrete (solid, soft, liquid, gaseous)... These are very general object classes of *inanimate concrete* nouns, which are being built at the LLI, along with classes of predicates.

The second type of criterion concerns the type of location : *internal* (e.g. presence of the preposition *dans* [“in”]), *external with contact* (e.g. presence of the preposition *sur* [“on”]) and *external without contact*. The choice of the feature is determined by two correlated factors : the semantic type of the verb, and the object class selected in the position of *goal*. For instance, the type of location expressed by the verbs *contenir* [“contain”] and *remplir* [“fill”] is *internal*; on the other hand, they select words referring to <concrete, discrete, hollow> in the position of *goal*.

3.2.3 Representation of the hyperonym/hyponym hierarchy

Some verbs belonging to the same semantic category are more general than others. For instance, *habiter dans* [“live in”] is more general than *loger dans* [“dwell in”] or *peupler de* [“people/populate with/by”]; and *couvrir de* [“cover with”] is more general than *badigeonner* [“whitewash”] or *répandre sur* [“spread on”]. It can be observed that the fewer restrictions the predicate imposes on the lexical selection of arguments, the more general it is, which is consistent with the rule of a reverse ratio between intension and extension. For example, *habiter dans* [“live in”] which selects all <places

to inhabit> is more general than *loger* [“*live in*”], which only selects <housing/accommodation> or than *peupler* [“*populate*”] which only selects <territories>.

4 A brief survey of the classification of locative verbs

Under some very general predicative phrases such as *être dans/sur* [“*be in/on*”] ou *se trouver dans/sur* [“*be found in/on*”] two large categories of locative verbs can be found : verbs expressing a *human/place locative relation* and verbs expressing a *concrete/concrete locative relation*.

4.1 Verbs expressing a *human/place locative relation*

This concerns about a hundred verbs selecting the following correlated object classes : <humans> and <places>; the most general sub-classes of the latter are <territories>, <grounds>, <buildings> and <rooms in buildings>. The most general verbs are *vivre* [“*live*”], *séjourner* [“*stay*”], *habiter* [“*inhabit*”], *s'installer* [“*settle*”]. Under them, one can find verbs referring to populating (*peupler* [“*populate*”]), housing (*loger* [“*live in*”]), or to a specific stay (*hospitaliser* [“*send to hospital*”]), *incarcérer* [“*jail*”], *héberger* [“*put so up*”], *camper* [“*camp*”]).

4.2 Verbs which express a *concrete/concrete locative relation* and do not presuppose a change in the way of occupying space

Object to be located : <solid, liquid, gaseous>

in <empty>, *on* : *occuper* [“*occupy*”]

in <empty> : *remplir* [“*fill*”]

on : *couvrir, recouvrir* [“*cover*”]

Object to be located : <solid : discrete>

in <protection> : *envelopper, emballer...* [“*envelop, wrap*”]

Object to be located : <human body>

on <solid> : *se coucher, s'asseoir, s'agenouiller...* [“*lie down, sit down, kneel down*”]

Object to be located : <solid : discrete : oriented>

on <solid> : *étendre/dresser...; relever/renverser...* [“*lay/erect...set upright/knock down*”]

partly *in*, partly *out* : *affleurer, planter...* [“*show on/through the surface, plant*”...]

Object to be located : <solid, discrete, massive>

on <liquid> : *flotter...* [“*float*”...]

in <liquid> : *immerger, flotter dans...* [“*immerse, float in*”...]

in <solid> : *enfouir...* [“*bury*”...]

in <empty : hole, opening> : *boucher...* [“*fill in*”...]

Object to be located : <massive solid, collection of discrete items>

in <empty> : *bourrer, farcir...* [“*stuff*”...]

Object to be located : <liquid>

on : *répandre, mouiller, asperger...* [“*spill, wet, spray/sprinkle*”...]

in <solid> : *imbiber...* [“*saturate*”...]

in <liquid> : *additionner de...* [“*add/mix*”]

Object to be located : <gaz>

in <empty> : *insuffler, gonfler...* [“*blow, inflate*”...]

4.3 Verbs which express a *concrete/concrete locative relation* and presuppose a change in the object to be located

These verbs are not pure locative verbs. Many also belong to the category of verbs expressing a change in matter. They are often compatible with additional arguments as well as with appropriate adverbials which make their semantic classification possible (e.g. *rassembler en cercle* [“gather in a circle”], *étaler sur une surface de 2m²* [“spread over a surface of 2 square meters”], *écraser grossièrement* [“crush”]...

- Verbs presupposing a change in the way of occupying space

Object to be located : <collection of discrete items>

Disperser [“scatter”]

in <empty>, *on* : *disperser, disséminer* [“scatter in/on”]

épanandre, éparpiller... joncher, parsemer... [“spread, scatter, strew on/over/across”]

Object to be located : <collection of discrete items : particles>

Disperser [“scatter”]

in <empty>, *on* : *pulvériser, vaporiser* [“pulverize, sprinkle”]

Object to be located : <collection of discrete items>

Rassembler [“gather”]

in <empty>, *on* : *grouper, rassembler, regrouper...* [“group, gather, collect”]

Rassembler en hauteur [“gather in a vertical way”]

entasser en, amasser en... [“pile up”]

Rassembler en ordre [“gather in an organised way”]

ordonner, aligner, superposer... [“order/organise, line up, superpose”]

Object to be located : <soft massive>

on : *étaler, badigeonner, enduire, napper* [“spread; whitewash, coat with”]

- Verbs presupposing a physical change in the object to be located

Change by squeezing

compresser, comprimer, écrabouiller, écraser, ratatiner...

[“press, pack tightly, squash, crush, shrivel”]

broyer, hacher [“grind, mince”]

Change by dropping

affaisser, affaler, avachir, ébouler, écrouler, effondrer

[“subside, sag, make limp/flabby, crumble, cave in, collapse”]

Cause to disappear in

fondre, dissoudre, diluer [“melt, dissolve, dilute”]

- Verbs presupposing a change in the shape of the object to be located

Fold on

Object to be located <flat> : *plier, rabattre...* [“fold, fold back/over”]

Wind

Object to be located <flexible, long> : *enrouler, entortiller, recroqueviller...*

[“wind, twine, curl up”]

4.4 Verbs expressing external location

Limits : *limiter, enceindre* [“limit, bound”]

External location with contact or quasi-contact : *border...; plaquer contre... entourer...*
[“*hem...; plaster against...; surround*”...]

External location of an oriented goal : *dominer; précéder/suivre* [“*tower above; precede/follow*”]

5 Conclusion

The classification of predicative verbs is at the moment one of the three major research projects underway at the LLI. So far, 25 classes including some 7000 verb uses have been described with varying but on the whole rather high degrees of accuracy. The list can be found below:

Connecting verbs

Causality, implication

Verbs expressing physical phenomena

Physical properties : state of matter, temperature, shape, colour...

Appearance, disappearance, transformation

Verbs expressing an emission of sound, light, matter...

Relation to space 1 (movements)

Movements with a change of places

Movements without a change of places

Contacts, physical shocks

Relation to space 2 (stative verbs and state-causing verbs)

Location

Occupation of a place by an oriented object

Associations, mixtures

Alterations of a surface

Addition/removal of parts

Addition/removal of ingredients

Verbs of relation to the body

Take, hold

Body care : hairstyle, cosmetics

Sensations

Affectivity : emotions and desires

Verbs referring to thought and language

Cognition

Speech

Reading and writing

Artistic creation

Verbs referring to private and social life

Sexuality

Conflicts

Corporal attacks

Human stay

Army/places relation

Transfers in possession

It can be observed that there are still many classes left to be described. Facts are stored in a computerised data bank. A property-encoding system makes it possible to create links between classes of predicates on the one hand and argument object classes and types of syntactic properties on the other hand. A "user's handbook" of the data bank is being written. We hope this article will have shown that choosing the best frame of linguistic description is necessarily based on precise theoretical choices.

References

- Abeillé, A. 2002. *Une grammaire électronique du français*. Paris : CNRS Editions.
- Anderson, S.R. 1977. "Comments on the Paper by Wasow". In Akmajian, Culicover, Wasow eds. *Formal Syntax*. New York : Academic Press.
- Boons, J.P., Guillet, A. & Leclère, C. 1976. *La structure des phrases simples en français : constructions intransitives*. Genève-Paris : Droz.
- Gross, M. 1975. *Méthodes en syntaxe*. Paris : Hermann.
- Gross, G. 1992. "Forme d'un dictionnaire électronique". In Clas, Safar ed. *L'environnement traductionnel*. Sillery : Presses de l'Université du Québec.
- Gross, G. 1994. "Classes d'objet et description des verbes". *Langages* 115. Paris : Le Seuil.
- Guillet, A. & Leclère, C. 1992. *La structure des phrases simples en français : constructions transitives locatives*. Genève-Paris : Librairie Droz.
- Harris, Z. 1976. *Notes du cours de syntaxe*. Paris : Le Seuil.
- Le Pesant, D. & Mathieu-Colas, M. eds. 1998. *Langages* 131 : *Les classes d'objets*. Paris : Le Seuil
- Levin, B. 1993. *English Verb Classes and Alternations*. Chicago : The University of Chicago Press.
- Sag, Y. & Wasow, T. 1999. *Syntactic Theory : A Formal Introduction*. Chicago : The University of Chicago.