

Towards Invariant Meanings of Spatial Prepositions and Preverbs¹

Jean-Pierre Desclés

Paris-Sorbonne
LaLIC
96, bd. Raspail
75006 Paris, France

Jean-Pierre.Descles@paris4.sorbonne.fr

Ewa Gwiazdecka²

Paris-Sorbonne
LaLIC
96, bd. Raspail
75006 Paris, France

Ewa.Gwiazdecka@paris4.sorbonne.fr

Azucena Montes-Rendon³

Paris-Sorbonne
LaLIC
96, bd. Raspail
75006 Paris, France

Azucena.Montes-Rendon@paris4.sorbonne.fr

Abstract

This work presents the semantical analysis of the two spatial prepositions and associated prefixes, the French *sur*, *sur-* (on) and the Polish *przez*, *prze-* (across). We propose a theory of abstract places (loci), as a method of description which helps to build an invariant meanings of the two linguistics units.

1 Introduction

Natural languages encode spatial and temporal representations in many various ways (deictics, prepositions, verbal lexicon and preverb). This article presents analyses of the two prepositions and associated preverbs, the French *sur*, *sur-* (on) and the Polish *przez*, *prze-* (across). We are particularly interested in the way the preposition and preverb determine a place.

It is interesting to note that from a diachronical view point (Bally, Meillet, Witkowska-Gutkowska) spatial prepositions become preverbs. Two problems arise : Is the meaning of the preverb composed with the meaning of lexical predicate? Does the meaning of the preverb have a prepositional origin? It is however impossible to present in this short article the results of our analysis; we show only the methods by means of two mentioned examples. We note that the work on other

prepositions and preverbs in French, Polish and Spanish are in progress.

Many linguists (Benett, Culioli, Pottier, Talmy...) have recognized the necessity of quasi-topological analysis for studying space encoded by languages. However, it seems to us that the elementary topology as defined for mathematical analysis, does not capture exactly the linguistic problems in an adequate way. For instance, the idea of boundary as expressed by languages does not always refer to a point or limit. On the other hand, the understanding of a place cannot be reduced to the spatial notion. Indeed, from the cognitive point of view, natural languages use more abstract notion while referring to the place. Thus, we represent spatial place but also temporal and notional as, for instance, in Pottier's approach (Pottier:1992).

We propose a theory of abstract places called "Abstract Loci Theory". This theory uses operators like in Kuratowski's algebra for elementary topology (Engelking: 1989). However, in this article, the operators of interiority, exteriority, closure and boundary are defined with new properties such that we obtain a "quasi-topological" structure: the interiority and exteriority operators are not idempotent and the interiority of the boundary is not always empty. We note respectively INT, EXT, FRO, FER, the new operators of interiority, exteriority, boundary and closure in this Abstract Loci Theory. We propose to give an informal approach to the main aspects of this theory as it is in progress.

¹ The research was granted by Projet Cognitique "Espaces, langues et cognition" Ministère de la Recherche, Paris, France.

² Granted by the scholarship of French Government.

³ Granted by ANUIES-SUPERA, Mexican Government.

The notion *locus* refers to abstract place (spatial or temporal or notional). Let \mathfrak{R} be a referential domain and let the locus LOC be a part of \mathfrak{R} .

This locus LOC builds a partition of \mathfrak{R} composed of three parts (see figure 1):

INT (LOC): interior locus of LOC;

EXT(LOC): exterior locus of LOC;

FRO(LOC): boundary locus of LOC between EXT(LOC) and INT (LOC).

The interior locus of LOC in Abstract Loci Theory has the following properties:

$\text{INT}(\text{INT}(\text{LOC})) \subseteq \text{INT}(\text{LOC}) \subseteq \text{LOC}$

If $\text{LOC}_1 \subseteq \text{LOC}_2$ then $\text{INT}(\text{LOC}_1) \subseteq \text{INT}(\text{LOC}_2)$

$\forall \text{LOC}, \text{INT}(\text{LOC}) \neq \emptyset$

The exterior locus of LOC is such that it is included in the complement of LOC.

The closure locus of LOC is defined as:

$\text{FER}(\text{LOC}) = \text{INT}(\text{LOC}) \cup \text{FRO}(\text{LOC})$

with the following property:

$\text{FER}(\text{FER}(\text{LOC})) \supseteq \text{FER}(\text{LOC}) \supseteq \text{LOC}$

Inside FRO(LOC) we distinguish two other loci, internal boundary and external boundary, such that :

$\text{FRO-int}(\text{LOC}) = \text{LOC} \setminus \text{INT}(\text{LOC})$

$\text{FRO-ext}(\text{LOC}) = \text{FER}(\text{LOC}) \setminus \text{LOC}$

The boundary locus is then defined as:

$\text{FRO}(\text{LOC}) = \text{FRO-int}(\text{LOC}) \cup \text{FRO-ext}(\text{LOC})$

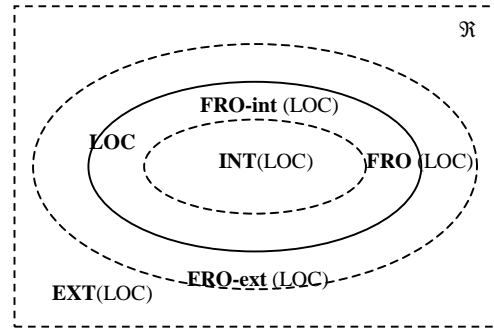


Figure 1

We introduce the "anchoring relation" (French: repérage) between the "anchored entity" (repéré) and the "anchor entity" (repère). This relation is in general non-symmetric (Desclés, Froidevaux: 1982, Culioli: 1990). The analysis of the meaning of the preposition is done by means of Abstract Loci Theory and anchoring relation, where the preposition determines an anchor (Flageul: 1997, Desclés: 1998a).

Our hypothesis is that it is possible to exhibit an invariant meaning in abductive process. We understand this invariant as cognitive representation which does not occur in natural languages (Desclés and alii: 1998).

We consider the syntactical compositionality as an application of verbal prefix to verbal predicate in order to build a complex predicate (e.g. *sur*-applies to *veiller* for building a complex predicate *surveiller*) (Desclés: 1998a). However, on the representational level, the compositionality between the meaning of the preverb and that of the verb forms a new semantical construct; the result that cannot be described by a simple function, but is rather conceived as complex interaction between semantical units.

2 *Sur* and *Sur-* in French

2.1 The French preposition *sur* (on)

Let us analyze the prepositional examples by means of the above explained method. In the example below:

(1) *Le livre est sur la table*

The book is on the table

the preposition *sur* expresses the position of the entity *the_book* (anchored) to the surface of *the_table* (anchor) according to the high-low gradient (gravity) which is orthogonal to the

anchor. There is a contact between these entities. The preposition *sur* indicates the external boundary locus- FRO-ext (*the_table*) of anchoring.

(2) *L'affiche est sur le mur*
The poster is on the wall

(3) *La mouche est sur le plafond*
The fly is on the ceiling

The preposition *sur* in (2) indicates the anchoring relation between *the_poster* (anchored) and in (3) FRO_ext of *the_wall* (anchor), *the_fly* and FRO_ext of *the_ceiling*. There is contact in these examples. The gradient is determined by some other kind of force, which is not gravity.

(4) *Les ponts sur la Moselle*
The bridges on the Moselle river

We can analyze the preposition *sur* in (4) like in (1) that is, we have the anchoring relation to FRO_ext of *the_river* according to the high-low gradient, without contact.

(5) *Luc appuie sur une touche du piano*
Luc presses a key of the piano

Luc controls the action considered as an oriented movement establishing a contact between *his_hand* and the FRO_ext of the *piano_key*. The gradient is determined by the action expressed through the verb *appuyer* (to press).

(6) *Le regard de Jean tombe sur sa fille*
The glance of Jean falls on his daughter

Jean controls the oriented movement of his glance. This movement is directed to the external boundary locus of the visibility determined around *his_daughter*. Hence a gradient is determined by the orientation of the movement of his glance.

(7) *Je l'attends sur les onze heures*
I'm waiting for him around eleven o'clock

This is a temporal example where *eleven_o'clock* is an interval considered as anchor. The global vision of this temporal locus explains the meaning of the preposition *sur*, glossed as: "being over (FRO_ext) the locus *around_eleven_o'clock*".

We can describe the invariant meaning of the preposition *sur* as anchoring relation of an entity

to the external boundary locus, FRO_ext(LOC), according to an orthogonal gradient. We note that the contact between the entities is not necessary.

2.2 The French Preverb *sur-*

The same analysis as for preposition is applied to the preverb *sur-*.

(8) *L'avion survole Paris*
-> The plane flies over Paris

The complex predicate *survoler* (to overfly) in (8) provides two pieces of information: one is related to the verb *voler* (to fly) and the other, to the preverb *sur-*. This preverb indicates that the position of movement of *the_plane* is localized to the FRO_ext of *Paris*, according to the high-low gradient. There is no contact.

(9) *Pierre surélève la table*
-> Pierre raises the table over something

In this example, the preverb *sur-* indicates that *the_table* is put on the external boundary of a higher place (FRO_ext).

(10) *La lanterne surmonte la porte*
-> The lantern is over the door

In (10), the glance of any observer starts from the low part of *the_door* and rises up, to visualize *the_lantern* which is on the FRO-ext of the superior part of *the_door*. Here, we have to do with static description.

(11) *Le magasin surbaisse les prix des vêtements*
-> The shop lowers the prices beyond a threshold

The preverb *sur-* in (11) indicates that the action expressed by the verb *baisser* (to lower) is realized beyond the established threshold, that is, the verb is realized on the external boundary locus (FRO-ext of *threshold*), the notional locus being organized by the prices.

(12) *Emilie suralimente son bébé*
-> Emilie feeds her baby over the threshold

In (12), the process indicated by the accumulative verb *alimenter* (to feed) continues towards a boundary of accomplishment, this boundary being beyond a threshold (correct feeding of a baby). The preverb *sur-* indicates that the boundary is "above" the threshold.

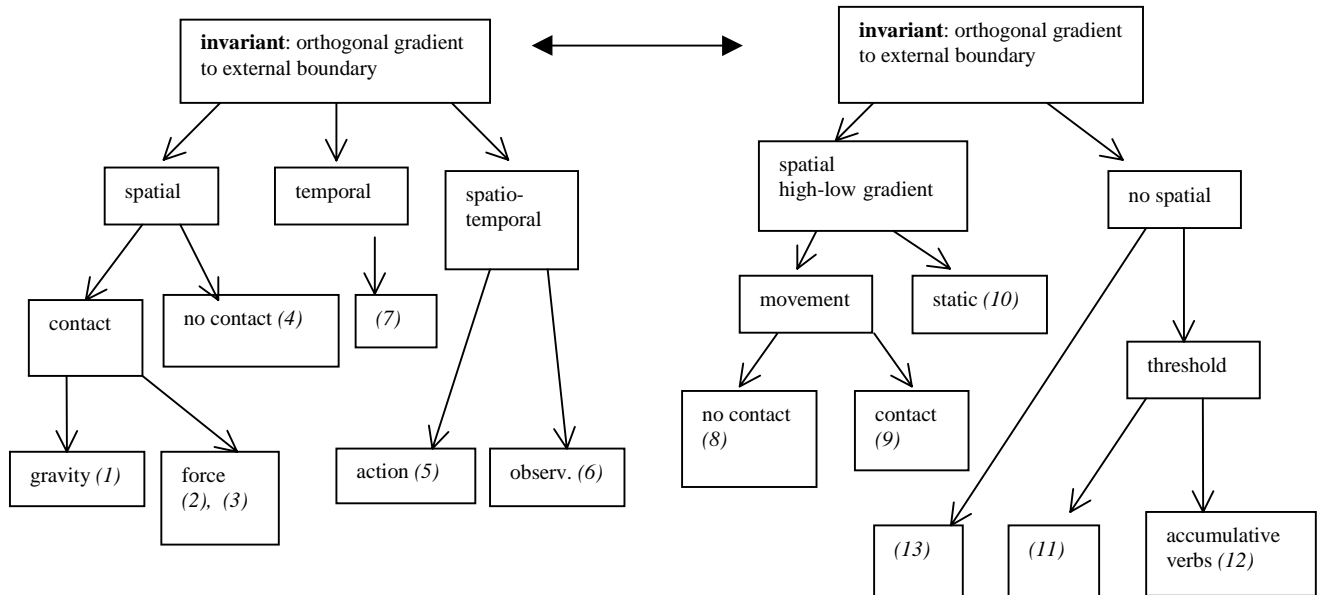
Consequently, the process goes over this threshold.

(13) *Luc surmonte ses problèmes*

-> Luc overcomes his problems

We analyze the meaning of (13) as follows: *Luc* is anchored to the abstract locus (the activity "being affected by problems"). The verb *monter* (to rise up) is used to show that *Luc* becomes less and less affected by *his_problems*, until he becomes completely unaffected.

The spatial use of the preverb *sur-*, is oriented according to the high-low gradient (gravity) (8,9,10) and the position above the external boundary of an anchor. In the other cases (11,12,13), the preverb *sur-* indicates a position above the external boundary of locus, organized according to some gradient. The cognitive representation (see figure 2) shows the net meaning of preposition *sur* and preverb *sur-*, as well as the common invariant meaning of them.



Net of prepositional meaning *sur*

Net of preverbal meaning *sur-*

Figure 2

3. *Przez* and *Prze-* in Polish

3.1 Polish Preposition *przez* (across)

The preposition *przez* in the example below expresses the idea of crossing the locus:

(14) *Sekwana płynie przez Paryż*
 Seine to flow across Paris

The Seine flows through Paris

Parts of *river* pass through the locus *Paris*. We consider in (14) five salient phases of the passage: at the beginning of the process, the parts of *river* are localized to the exterior EXT(LOC), then to the boundary FRO(LOC), they arrive in

the interior INT(LOC), passing again the boundary FRO(LOC), and coming out to EXT(LOC). The double passage through the boundary locus presupposes an orientation of this locus, imposed here by the flow of the river.

(15) *Słońce zagląda przez okno*
 sun to come in across window

The sunshine comes in through the window

This example introduces an intermediate locus IME(LOC) inside the FRO(LOC) with FRO-ext and FRO-int, considered as locus of communication between EXT(LOC) and INT(LOC). The passage implies three salient phases of the movement. We note that

IME(LOC) is encoded in natural languages as the privileged passage (door, window...).

(16) *Darek nie przychodził przez cały miesiąc*
not to come across whole month
 Darek has not come for the whole month

The meaning "crossing a locus" is present in (16) considering *miesiąc* (the month) as a locus of temporal nature. We pass through the boundary FRO(LOC) through interior INT(LOC) to the second boundary FRO(LOC), the locus being temporally oriented.

(17) *Przez ciebie zmęczyłam się*
across you to get tired
 I got tired because of you

We analyze (17) using the intermediate locus IME(LOC), but on a more abstract level. Let us consider a domain related to the notion "tiredness". The exterior EXT(LOC) is related to "not being tired", while the interior INT(LOC), to "being tired". To pass from EXT(LOC) into INT(LOC), we need to cross IME(LOC), which refers to a notional locus "you". Consequently, three salient phases are taken into account.

(18) *Rozmawiałam z nim przez telefon.*
to speak with him across phone
 I spoke to him over (across) the phone

We need to "cross" an instrument *the_phone* to reach another person, thus we also refer to the intermediate locus IME(LOC) in the domain of communication.

We have so far discussed the examples taking into account the meaning of the Polish preposition *przez* in regard to the proposed concepts of the Abstract Loci Theory. We may now structure those examples. On the one hand, we distinguish spatio-temporal, temporal and notional loci, and on the other hand, we have shown two related representations of the prepositional meaning: the one refers to crossing a locus, the other uses an intermediate locus while crossing. Based on these analyses, we consider an invariant meaning of the preposition *przez* as crossing a boundary locus.

3.2 The Polish Preverb *prze-*

We will now establish a similar analysis of preverbal examples *prze-*, in order to show an invariant meaning of the complex predicate. To simplify our study we omit the aspectual consideration of the preverb, taking into account

only the relationship to the meaning of the preposition.

(19) *Przeszedł przez ulicę*
across-to walk across street
 He walked across the street

We encounter here "crossing" the locus *ulica* (street) expressed by compositionality between the preverb *prze-* and the lexical predicate *iść* (to walk). Five salient phases are considered in (19): a passage from the exterior EXT(LOC) to the boundary FRO(LOC), then to the interior INT(LOC), next to another boundary FRO(LOC) for going out, to the exterior EXT(LOC). The locus *ulica* (street) is temporally oriented.

(20) *Przelał wino z beczki do butelki*
across-to pour wine from barrel to bottle
 He poured wine from the barrel into the bottle

The semantic description of (20) appeals to an intermediate locus IME(LOC), which is not specified here. The compositionality between *prze-* and *lać* (to pour) means that the entity (*wine*) is localized to exterior locus (*barrel*) and crosses the intermediate locus IME(LOC) to be localized to the interior INT(LOC) (*the_bottle*).

(21) *Anna przeczytała książkę*
across-to read book

She read the book "across"/ She achieved her reading

The compositionality takes into account not only the preverb *prze-* and the predicate *czytać* (to read), but also the object *książka* (the book). The action of reading is thus simultaneous to "crossing" the object *the_book* conceived as a locus. Thus, we consider three salient phases: boundary FRO(LOC) (the beginning of the book), interior INT(LOC) and boundary FRO(LOC) (the end of the book and the end of reading, in the sense achievement of this action).

(22) *Przemalowała ściany na zielono*
across-to paint wall into green
 She has repainted the wall in green

The example (22) expresses the property change affecting an object. In the domain related to colors, we consider the first color as an exterior EXT(LOC). "To reach" the other color, considered as interior INT(LOC), we need to cross an unspecified intermediate locus IME(LOC). Changing the property is oriented in time.

(23) *Matka przekarmiła dziecko*

mother across-feed baby
 The mother overfed the baby

Some accumulative verbs (to salt, to cook) imply a change towards a threshold. The prefix *prze-* in connection to the predicate *karmić* (to feed), indicates the passage from the exterior EXT(LOC), to which we associated the meaning “not enough”, through intermediate locus IME(LOC). The amount of food in IME(LOC) is accurate. “Passing” into interior INT(LOC) is interpreted as “too much”. The amount of food organizes these locus.

(24) Jan *przegrał wszystkie pieniądze w kasynie*
 across-toplay all money in casino
 "Jan has played across all his money"
 Jan has lost all his money in casino

The domain is related here to the game. We consider the passage from EXT(LOC) (having enough money) through the intermediate locus IME(LOC) (still having money) into the interior

INT(LOC) (having no money). The bet organizes the locus.

We organize now the preverbal examples in the way we did it for the preposition. We note that the preverb introduces a dynamic change while composed with the predicate. This is due to its perfectivizing role that we do not develop in this article. The examples (19) to (22), express the meaning "crossing" a locus or "crossing it through an intermediate locus". We encounter as well the explicit idea of going over a threshold (23 & 24). The invariant meaning for the preverb composed semantically with a predicate is thus crossing the boundary locus, the same as in the prepositional case. Given the analysis of preposition and the associated preverb, we can now establish the relation between the nets of meanings (see figure 3)

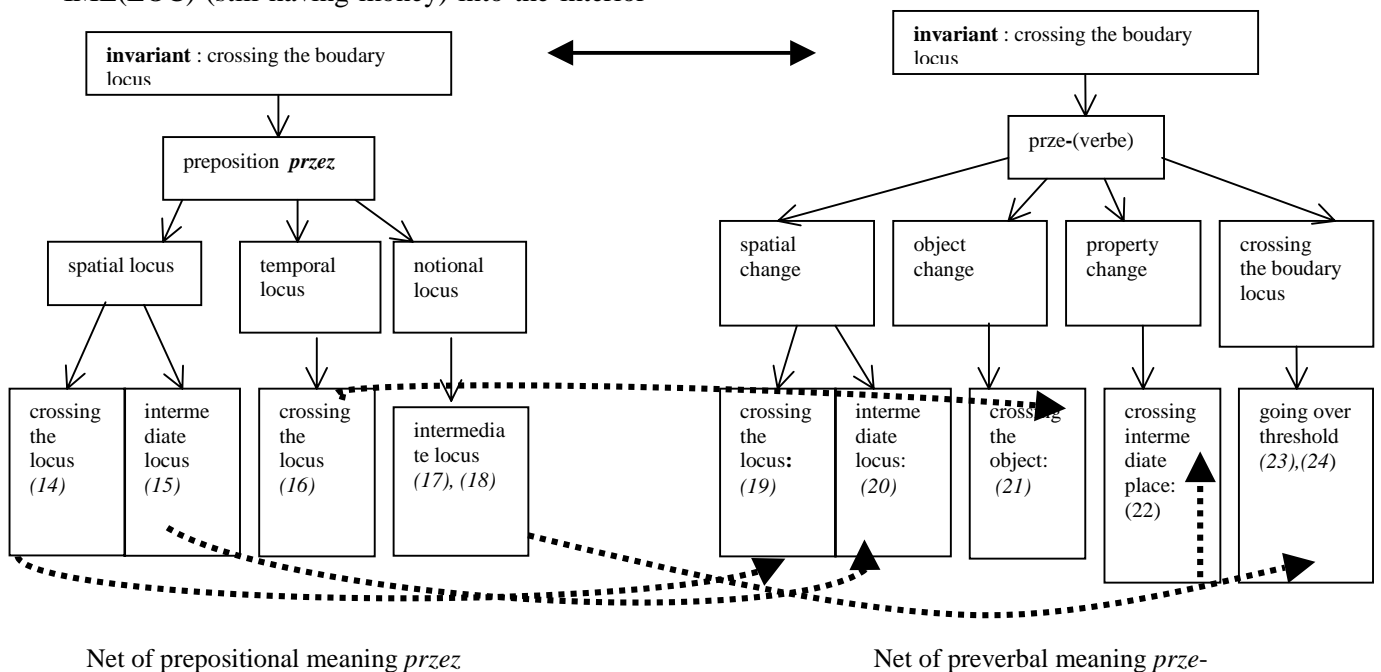


Figure 3

3 Conclusion

The analysis of prepositional examples of *sur*, led us to establish an invariant meaning, which corresponds to anchoring to the external boundary locus with a gradient. The invariant meaning of the preposition *sur* corresponds to the invariant meaning of the preverb *sur-*.

This result seems more general than the analysis of C. Vandeloise (Vandeloise: 1985), as the resemblance family *porteur-porté* established in his work does not explain the examples (5)-(7) of *sur*. As for the Polish preposition *przez* and its associated preverb *prze-*, we managed to establish the same invariant meaning for the two linguistic units: it refers to "crossing the boundary locus". However, this analysis does not

take into account the aspectual consideration of the prefix, which in Polish has a perfectivizing role; the same approach will be used in the semantical studies of aspect in Polish. Our results may be compared to the analyses for the preposition *przez* and preverb *prze-* obtained in the framework of the Langacker's grammar (Dabrowska: 1996), but the latter does not use any topological approach.

We claim that the invariant meaning is not universal across natural languages. Each natural language organizes its own cognitive representations (Desclés: 1998b) as it was shown, for example, by Bowerman (Bowerman: 1996), who compared different meanings of the preposition across few languages:

apple **in** bowl, b. handle **on** pan, c. bandaid **on** leg, d. right **on** finger, e. fly **on** door.

| | a | b | c | d | e |
|---------|------|----|-----|----|-----|
| English | in | on | on | on | on |
| French | dans | de | sur | à | sur |
| Dutch | aan | op | om | op | aan |

If we look now at the following sentences in English, Spanish, Polish and French:

- (i) *The book is on the table*
- (ii) *El libro esta en la mesa*
- (iii) *Książka jest na stole*
- (iv) *Le livre est sur la table*

The prepositions *on*, *na*, *en* in these examples are translated by the French *sur*. And yet, the analogues of *sur* in English, Spanish and Polish correspond only to a particular meaning of *sur*, the value given in (1). The invariant meanings of *on*, *na*, *en* are always defined within respective languages.

If we consider the preverbal examples:

- (12) *Emilie suralimente son bébé*
-> Emilie feeds her baby over the threshold
- (23) *Matka przekarmiła dziecko*
The mother overfed the baby

we notice that the two sentences have the same state of affairs, but their cognitive construal is related to each language (French or Polish). Thus, in (12) the prefix *sur-* indicates the process that continues up to the degree situated over the threshold, while (23) indicates the passage from "not enough" to "going over the threshold". This passage is present in (12), however it is considered as a secondary effect.

In Fregean words: (12) and (23) have the same *Sinn*, but differ in *Bedeutung*.

4 Bibliography

BALLY, Charles. 1954. *Linguistique générale et linguistique française*. Francke, Bern.

BENNETT, D. C. 1975. *Spatial and temporal uses of English Prepositions*. London: Longman.

BOWERMAN, Melissa. 1996. "Cognitive versus linguistic determinants." In Gumperz & Levinson (eds.). *Rethinking linguistic relativity*, pp. 144-176.

CULIOLI, Antoine. 1990. *Pour une linguistique de l'énonciation. Opérations et représentations*. Tome 1. Ophrys.

DŃBROWSKA, Ewa. 1996. "The spatial structuring of events: A study of Polish perfectivizing prefixes." In Martin Pütz & René Dirven (eds.). *The Construal of Space in Language and Thought*. Mouton de Gruyter. Berlin New York. pp. 467-489.

DESCLÉS, Jean-Pierre. 1998a. "Préposition spatiales, relateurs et préverbes." Actes du Colloque *Les relations*, Lille, mars (in press).

DESCLÉS, Jean-Pierre. 1998b. "Les représentations cognitives du langage sont-elles universelles?" In Matteo Negro, (ed.). *La réalité et le signe*. Editions Universitaires, Fribourg, Suisse. pp. 53-81.

DESCLÉS, Jean-Pierre., FROIDEVAUX, Christine. 1982. "Axiomatisation de la notion de repérage abstrait." *Mathématiques Informatique et Sciences Humaines*, 78: 73-119.

DESCLÉS, Jean-Pierre., FLAGEUL, Valérie., KECKENBOSCH, Christiane., MEUNIER, Jean-Marc., RICHARD, Jean-François. 1998. "Sémantique de l'action." *Langages*, 132: 28-47.

ENGELKING, Ryszard. 1989. *General Topology*. Helderman Verlag. Berlin.

FLAGEUL, Valérie. 1997. *Description sémantico-cognitive des prépositions spatiales du français*. Thèse de doctorat. Université de Paris-Sorbonne.

LANGACKER, Ronald. 1987, 1991. *Foundations of Cognitive Grammar* I, II. Stanford: Stanford University Press.

MEILLET, Antoine. 1937. *Introduction à l'étude comparative des langues indo-européennes*. Paris

POTTIER, Bernard. 1992. *Sémantique générale*. Presses Universitaires de France.

TALMY, Leonard. 1983. "How Language Structures Space" in H. Pick, L. Acredolo (eds), *Spatial Orientation: Theory, Research and Application*. New York: Plenum Press. pp. 225-82.

VANDELOISE Claude. 1985. "Les prépositions SUR/SOUS et la relation PORTEUR/PORTE" *Leuvense Bijdragen* 74 pp. 457-481.

WITKOWSKA-GUTKOWSKA, Maria. 1989. "Funkcje czasownikowego przedrostka przy- w porównaniu z funkcjami przyimka przy w języku polskim." *Acta Universitatis Lodzianis; Folia Linguistica* 21.