Corela

Cognition, représentation, langage

HS-23 | 2017

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Electronic version

URL: <http://journals.openedition.org/corela/5013>

DOI: 10.4000/corela.5013

ISSN: 1638-573X

Publisher

Cercle linguistique du Centre et de l'Ouest - CerLICO

Electronic reference

Claude Vandeloise, « Genesis of spatial terms », *Corela* [Online], HS-23 | 2017, Online since 07 November 2017, connection on 19 April 2019. URL : <http://journals.openedition.org/corela/5013> ; DOI : 10.4000/corela.5013

This text was automatically generated on 19 April 2019.

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Genesis of spatial terms¹

Claude Vandeloise

- 1 A parallelism is often established between the production of a language by a culture (phylogeny) and its reproduction by children (ontogeny). The basic spatial words in different languages will be used in this article in order to investigate the similarities and the discrepancies between the two processes. Concerning the creation of spatial words, section 1 establishes a contrast between what I call *external lexical formation*, in which a word is associated to an extra-linguistic concept, and *internal lexical formation*, that proceeds by *division* or *union* of established lexical categories. In section 2, I will discuss a hierarchy in the formation of spatial terms in languages of the world (Levinson and Meira 2003) inspired by an implicational scale for the creation of basic color terms proposed by Berlin and Kay (1969). MacLaury (1991) motivates this development by creating a hierarchy involving a process of internal lexical formation by division. I will compare these hypotheses to another hierarchy proposed in Vandeloise (2003, 2005). This hierarchy establishes a basic contrast between the relation of *localization*, conveyed in French by the preposition *à*, and the dynamic relations of *control*, expressed by *in* and *on*.
- 2 Three modes of lexicon development are investigated in section 3. Whereas the creation of basic color terms may go from the most general to the most specific, as illustrated by MacLaury, the creation of words often evolves in the reverse direction, from the application of a word to very specific situations to its extension to more general uses. In contrast to the former mode of creation that operates by division, the latter mode of internal lexical formation proceeds by union. If external lexical creation anchors a word in the middle of a hierarchy of concepts, both processes can occur to create supercategories and subcategories. In contrast to the linguistic community that builds its language from scratch, infants pick their first spatial words inside a complete and well-structured language. In section 4, I will attempt to explain how the different levels of abstraction of spatial words can influence the acquisition of spatial words.

1. External and internal lexical formation

- 3 According to one of the main dogmas of structuralism, the meanings of words emerge negatively, from their differences with other words in the language. These differential meanings are called *values* (Saussure 1916). I will come back to them when I speak of internal lexical formation. This conception of meaning, however, poses an obvious logical problem once one considers the production of language and the first words created in the lexicon. This problem has not been urgent as long as language creation was considered a taboo subject, unworthy of linguists' attention. Once this interdiction is transgressed, though, one must admit that, according to the differential hypothesis, the first words can only be created by pairs (x, y), with x determining the value of y and vice versa. This may make sense for pairs like *here* and *there* or *yes* and *no*. But if one admits that among the first words appear also terms for actions (like *eat*) or names for persons (like *Peter*), complementary words designating any action that is not eating, or any human who is not Peter, are more difficult to conceive. The meaning of these words cannot emerge from differences in a system but may only be explained by the extra-linguistic stimulations that make these terms convenient to ensure the good functioning of the society in which they emerge. This is what I call external lexical formation. It occurs when the members of a society share a common interest in an aspect of their environment or of their social life ; when they are able to recognize this aspect in a sufficiently similar way ; and when they associate a term to this aspect of their lives.
- 4 The existence of external lexical formation, mainly based on *similarities* between the occurrences in the world designated by a word, does not preclude a very important role for internal lexical formation. In this case, a term is applied to aspects of environment or social life because *differences* with aspects of the world designated by the available words in the lexicon begin to appear pertinent for the ease of communication. Linguists have been much more interested in internal lexical formation. Its functioning is much better documented than the development of external lexical formation. The domain of colors is a perfect field to observe this type of formation. The work of Berlin and Kay (1969), devoted to basic color terms and to their hierarchical appearance in the development of language, will be essential for this article. This book was equally an important source of inspiration for the typology proposed by Levinson and Meira (2003) that will be discussed in the next section. According to these authors' interpretation of Berlin and Kay's implication scale, color terms appear in the following order in the languages of the world :
- White +Black→ Red→ Green or Yellow→ Yellow or Green→ Blue→ Brown→ Purple
Pink
Orange
Grey
- 5 This means that a language that possesses a color term on the right of the scale necessarily includes all others to the left of this term.
- 6 The formation of basic color terms in this implicational scale cannot be explained by internal lexical formation only. At the beginning of the scale, an internal lexical formation of *white* and *black* might be justified by the contrast between *day* and *night* (Wierzbicka 1990). In this case, however, it would not be a genuine color contrast. Taken together, *white* and *black* might be opposed to a word meaning *colorful* but certainly not to

red alone as proposed in the above scale. At the end of the implication scale, *brown* is also very unlikely to be created from a category including *brown* and *blue* by internal lexical formation. Some amount of external lexical formation, then, must be involved in the creation of the first and the last “basic color terms”.

- 7 The creation of basic color terms has been carefully observed by MacLaury (1991), who compares the evolution of two Mayan languages, Tzeltal of Tenejapa and Tzotzil of Novenchuuc, from a system of two color terms to a system of six color terms. He proposes an interpretation of Berlin and Kay’s implicational scale that is more compatible with internal lexical formation (see chart 1).

Chart 1 MacLaury’s implicational scale

- 8 In chart 1, the places of *black* and *white*, the two first terms of the implicational scale, are occupied by the category of dark or cool colors and by the category of light or warm colors, respectively. *Red* and *yellow*, third and fourth in the implicational scale, are the result of the split of warm colors whereas *green* and *blue*, fifth and sixth in the implicational scale, are the result of the split of cool colors.² What is the destiny of *dark* and *light* at the second level remains an open question: do these categories remain without linguistic representation, or are they conveyed by words equivalent to *black* and *white*?
- 9 The category of cool colors that gathers green and blue in chart 1 is often called “grue”. The split of the category of cool colors into *green* and *blue* provides an exemplary case of internal lexical formation. At the beginning, suppose that *green* is indifferently used for the green or blue tokens of the “grue” category. Inside this general category appears a new word *blue* that is used by innovative speakers for blue objects only. At a first stage, *green* can still be used for blue objects, in such a way that *blue* may be considered as a hyponym of *green*. With evolution, and the disappearance of more conservative speakers who prefer *green* to *blue*, a second stage appears at which *green* can no longer be applied to blue objects and restricts itself to “grue” objects that are not blue, i.e. to green objects. In this way, at the third and final stage, the connection between *green* and *blue* is severed: *green* applies only to green objects and *blue* to blue objects.
- 10 The case of the “grue” category is a perfect example of internal lexical creation, because the similarities between green and blue makes plausible the existence of a category including the two colors. In contrast, at the origin of the implicational scale of Berlin and

Kay, it is difficult to imagine a category gathering black and white from which these terms emerge. *White* and *black*, then, are examples of external lexical formation and *green* and *blue* are examples of internal lexical formation, as illustrated in figure 1. External and internal lexical formation will prove useful in section 2 for the comparison of English spatial words *in* and *on* with Spanish *en* and *sobre*.

Figure 1 Internal vs. external lexical creation

2. Creation of spatial words

- 11 Berlin and Kay (1969) provide an implicational scale according to which basic color terms develop in the languages of the world. This may provide a first insight in lexical formation. In this article, I will be concerned with the creation of spatial terms. I will present the analysis of Levinson and Meira (2003) before arguing for an alternative solution based on preceding articles (Vandeloise 2003, 2005). Like Berlin and Kay (1969), Levinson and Meira use a sample of genetically unrelated languages. Informants in each language were asked to ascribe an adposition in their language to a booklet of 71 line-drawings known under the name of “topological relations picture series”. As in the case of the attribution of basic color terms, the choices tended to cluster and were not randomly distributed as they would be if there were no cross-linguistic generalizations. The five main clusters are labeled IN, NEAR/UNDER, ON/OVER, ATTACHMENT and ON-TOP. On the basis of these data, Levinson and Meira propose the following implicational scale for spatial terms.

AT < IN < ON	< OVER < ON-TOP < ATTACHED < INSIDE <	SPIKED
UNDER NEAR		HANGING
		DISTRIBUTED-OVER

- 12 They elaborate this implicational scale to show how different languages can develop spatial terms in different ways. I modify the presentation of their analysis (figure 18, p. 512), in order to make the comparison with my solution easier.

Chart 2 Levinson and Meira's implicational scale

- 13 AT_1 is a unique spatial notion that covers all the spatial relations and corresponds to the adposition *ta* in a language like Tzeltal or *di* in Indonesian (Feist 2004). AT_2 , AT_3 and AT_4 are more and more specific notions. Thus, AT_2 covers all spatial relationships with the exception of those conveyed by IN-2D and IN-3D and AT_4 is a residue that excludes all the preceding notions, including NEAR. These processes correspond to internal lexical formation by division. Vertically aligned notions, such as IN-3D and IN-2D, as well as ON_1 , OVER, ON-TOP and ATTACHMENT, correspond to composite notions. Levinson and Meira split IN-2D and IN-3D because they attribute two foci to the category IN, one focus specifying containment in a three-dimensional container and the other inclusion in a two-dimensional plane. I will come back to this decision later in this section. Indices attached to ON_1 and ON_2 do not appear in Levinson and Meira's chart but they will make the exposition easier. At the last level of specification of chart 2, two options are offered for the decomposition of the complex concept ON_1 , OVER, ON-TOP and ATTACHMENT.
- 14 Levinson and Meira use capitals AT, IN and so forth to represent the “central meanings of the relevant sort” (footnote 2, p. 486) associated to the basic topological notions conveyed by *at*, *in* and so forth.³ ATTACHMENT is an exception to this convention. The authors are obliged to use this notional term instead of a preposition because English has no specific adposition to convey attachment. The use of capitals may be a handy way of introducing the prototypes of spatial relations but it raises some questions. First, why is AT chosen to represent the most general category in chart 2? The preposition *at* appears nowhere in the data or in the article and it is certainly not a good example of an inclusive spatial preposition. As we will see later, the Old English preposition *æt* might fit this role better. Second, there are discrepancies between the data coming from the experiments summarized in the map proposed by Levinson and Meira (p. 505) and chart 2. Indeed, IN represents a coherent cluster in the map but it splits in IN-2D and IN-3D in the chart. As a matter of fact, this is so because all the members in the IN-cluster correspond to IN-3D. Therefore, one may doubt whether IN-2D represents a “central meaning of the relevant sort”. The reason why IN-3D and IN-2D are grouped in the chart is not because they are

notionally related but because an identical preposition is assigned to them in English. On the other hand, NEAR/UNDER, as well as ON/OVER, corresponds to one cluster in the map of data but NEAR and UNDER, as well as ON and OVER, are disjointed in the chart. In my alternative, instead of AT, IN (with or without contact), I will use explicit notions like LOC (ALIZATION), CONTROL and so forth. For each notion, I will provide an example of a preposition attached to this notion in a language of the world.

- 15 Levinson and Meira are uniquely concerned with basic topological relationships between the located *target* and the *landmark* that locates it. For example, among the clusters in the map of data, ON/OVER is characterized by superadjacency (with or without contact), UNDER by subadjacency (with or without contact) and NEAR by proximity. Contiguity and coincidence are further topological notions present in the analysis. In contrast, the cluster IN corresponds to full containment (p. 508). Containment is certainly not a topological notion but the distinction between containment and the topological notion of inclusion is often blurred in the literature and many scholars appear to use them indifferently. In chart 2, Levinson and Meira make a distinction between IN-3D (a notion close to CONTAINMENT) and IN-2D (close to INCLUSION). In this way, they introduce a further topological notion in their analysis. The authors mention that a reviewer of their article “questions to what extent ‘attachment’ (and indeed other notions like ‘containment’ and ‘support’) are really spatial as opposed to mechanical in conception” (footnote 9, p. 505). The authors admit that some doubt is in order. The alternative proposed in chart 3 reinforces the contrast between topological basic categories and puts the role of force and energy to the forefront. Therefore, the first dichotomy established in chart 3 distinguishes between LOC (topology⁴) and CONTROL (dynamics). The discrepancies in the linguistic representation of these notions in the languages of the world create a problem for the typology proposed in chart 2. Indeed, the Spanish preposition *en* conveys both ON and IN notions. But in chart 2, ON and IN do not have a common direct hyperonym. If these notions belong to different branches of the structure, one may wonder why so many languages, like Spanish and Modern Greek, have a common adposition to designate both notions. The common status of IN and ON as opposed to AT constitutes the main discrepancy between my analysis and that of Levinson’s and Meira’s. Another famous example concerning control is Korean in which two verbs correspond to the English preposition *in*: the verb *kkita* that conveys tight fit, as opposed to loose containment conveyed by the verb *nehta*.⁵ Chart 3 makes this distinction possible.
- 16 Levinson and Meira exclude very pervasive spatial relations such as projective notions IN FRONT and BEHIND from their inquiry because “projective concepts belong to a different conceptual subdomain, where coordinate systems or frames of reference are necessary” (p. 488). It is true that projective prepositions do not correspond to topological notions, but control prepositions like *in* and *on* do not either. Projective spatial prepositions are basic spatial prepositions that will be introduced in chart 3. On the other hand, like Levinson and Meira, I will limit myself to static spatial relations. However, chart 4 describing the evolution of the Old English preposition *æt* will show how kinetic prepositions such as *from* and *to* might be incorporated in the genesis of spatial terms. UNDER and OVER will also be excluded from basic spatial categories in chart 3 for reasons I will give below. These two categories have a peculiar status in the analysis of Levinson and Meira. First, UNDER is the only basic category to appear simultaneously with another category (ON₁) in the partition of AT₂. No explanation is provided for this exception.⁶ Second, OVER appears first as a component of the composite concept ON₁/ON TOP/OVER/

ATTACHMENT. Depending on the languages, this composite category can split in two different ways. The former option, with OVER excluded, appears in English whereas Levinson and Meira attribute the latter option to Yucatec and Ewe. In their chart, they put ON₁, OVER, ON-TOP and ATTACHMENT at the same level. The relationship between ON₁ and ON-TOP is unclear. The only definition provided for the latter notion is “location above the eye-level” (p. 512), a definition contradicted by the utilization of ON-TOP for a picture representing a table covered by a tablecloth.⁷ As a matter of fact, except for this example, the pictures to which ON-TOP is ascribed correspond to the prototypical uses of *on* in English. Therefore, instead of being at the same level as ON-TOP, ATTACHMENT and OVER, ON₁ might be considered as a more general notion, including these three categories. One may furthermore cast in doubt the usefulness of the category ON-TOP. At any rate, in contrast to OVER and ATTACHMENT, ON-TOP never dissociates itself from ON₁ at the last level of specification.

- 17 In chart 3, the equivalent of AT₁ is called RELATION IN SPACE. These relations imply *accessibility* in space between two *material entities* ; between a material and a *spatial entity* ; or between two spatial entities. A spatial entity may be a place occupied by a material entity or a portion of space that material entities might occupy. Linguistic communities attribute names to *geographic* spatial entities. In the case of material entities, accessibility is guaranteed by *contact* or *proximity*.⁸ When a spatial landmark is involved in the relationship, there is *coincidence* or proximity of the target with the landmark. This coincidence is often partial since the landmark is usually larger than the target. Coincidence between two material entities is impossible. In many respects, proximity appears to be the most general ingredient of a relation in space. As a matter of fact, if contact and coincidence are considered as limit cases of proximity, this notion might be chosen to characterize relations in space at the most general level. Therefore, the occurrence in chart 2 of NEAR (representing proximity) at the same level as the most specific notion AT₄ is surprising. How can one and the same concept appear together at the most general and at the most specific level ? Because it is associated to the primitive notion of proximity, *near to* appears deceptively as a basic expression. However, far from being basic, the syntax of *close to* or *near (to)* in English or of *près de* in French demonstrate that these locutions, though related to the primitive concept of proximity, are complex notions. *Near* in English may be an adjective as well as a preposition and there are discussion in French (Gunnarson 1986) about whether *près* should be treated as an adverb, an adjective or a preposition. In the genesis I propose in chart 3, projective relationships in the vertical axis and in the horizontal plane will appear instead of NEAR. As a matter of fact, *near (to)* might be considered as a late hyperonym for all the prepositions involving proximity in the horizontal plane.
- 18 The most important division in chart 3 separates CONTROL (that implies an exchange of energy between the landmark and the target) from a residue of spatial relations, called LOC₁, that do not involve such an exchange of energy.⁹ By this division, LOC₁ is deprived of all the relations in space involving contact between two material entities, since —if one forgets magnets and radiations— contact is a necessary condition for control. LOC₂, then, is left with the spatial relationships involving at least one spatial entity on the one hand ; and with the relationships between material entities that are not in contact on the other hand. Thus, LOC₂ means that the target (partially) coincides with a spatial landmark ; or that it is close to a spatial or material landmark. At the corresponding stage of the development, chart 2 subtracts NEAR from AT₃. If PROXIMITY were similarly subtracted

from LOC_2 in chart 3, LOC_3 would be restricted to the spatial relationships containing at least one spatial entity and implying coincidence of the target and the landmark. Reasons to avoid the presence of PROXIMITY at this stage have been evoked in the preceding paragraph. Categories split because a subset of their members attracts more attention than the others or because there is a need for explicitness. In conformity with this principle, IN-3D in chart 2 or CONTROL in chart 3 are relations in space more constrained and prominent than AT_2 or LOC_1 , respectively. But why should relationships of proximity be more prominent than relationships of coincidence? Quite the contrary! Coincidence with the landmark locates the target more precisely than proximity which needs specification. This specification is, I believe, the role of projective prepositions. Actually, in the vertical axis, proximity may be too strong a word since *The sun is above the earth* does not involve proximity between the sun and the earth. Separation between the target and the landmark may be sufficient for the use of projective prepositions. I will make a distinction between separation in the vertical axis (VERTICAL SEPARATION) and separation in the horizontal plane (HORIZONTAL SEPARATION). Whereas VERTICAL SEPARATION admits material landmarks (*The lamp is over the table*) as well as spatial landmarks (*The airplane is above Paris*), HORIZONTAL SEPARATION prefers material landmarks and is used with difficulty with spatial landmarks: ?*The car is to the left of Paris*. Also, in French, *au-dessus* and *en dessous* maintain a connection with coincidence since, in contrast to *plus haut* and *plus bas*, these prepositions require coincidence of the vertical projection of the target with the landmark. For these reasons, in chart 3, I will first subtract VERTICAL SEPARATION from LOC_2 and then, subtract HORIZONTAL SEPARATION from LOC_3 . In internal lexical division, the emergence of a new term makes the use of the old term obsolete. This is true in the vertical axis in the French examples below:

- (1) La lampe est au-dessus/*à/ ?près de la table
- (2) La chaise est devant/*à/ près de la table
- (3) Le chat est à gauche/*à/ près de la table

19 *Près de*, in contrast, is compatible with the projective horizontal prepositions.

Chart 3 A hierarchy of concepts

¹ Besides static location, the French preposition *à* can also introduce the goal of the target like the preposition *to*.

² Separation along the frontal direction and along the lateral direction might need to be treated separately.

- 20 Chart 3 can be understood as a hierarchy of concepts going from the most abstract level to the most concrete levels. Languages like Tzeltal (Brown 1994) have only one adposition at the first level —*ta*— that introduces any spatial relations in space and leaves to verbs and nouns the elaboration of these relations. At this abstract level, the only spatial term opposes relations in space to the other grammatical functions, marked by cases like nominative, accusative and so forth. All the notions below LOC_1 are illustrated by prepositions in the same language. I have chosen French because *à* is more clearly related to localization (Vandeloise 1991) than *at* or *in*. Whenever a more specific preposition is added, the extension of the most general preposition diminishes. The process going from $\dot{a}_1$ to $\dot{a}_3$ proceeds by subtraction like the evolution from AT_1 to AT_4 in the analysis of Levinson and Meira. LOC_1 splits in LOC_2 and VERTICAL SEPARATION; and LOC_2 in LOC_3 and HORIZONTAL SEPARATION.
- 21 The nature of the development going from LOC_1 to the more specific levels in the chart is different from the development of CONTROL. Whereas the former notion evolves by division, the latter develops by specification. In contrast to the development of LOC_1 , the development of CONTROL in chart 3 is exemplified by prepositions in different languages. General control is conveyed by the Spanish preposition *en*. The prepositions *in* and *on* in English, and the Korean verbs *kkita* and *nehta* as well as the Dutch prepositions *op* and *aan*, correspond to more and more specific types of control. Whereas *in support*, conveyed by *on*, the bearer controls the burden in the vertical direction only, containment, conveyed by *in*, requires control in more than one direction. *Kkita* and *nehta* mark tight fit and loose containment of the target in the landmark respectively¹⁰ while *op* and *aan* convey direct support and indirect support, respectively. I propose this hierarchy in Vandeloise (2003) to show that the relativity in the description of space illustrated by Spanish, English, Korean and Dutch is less dramatic than claimed by Bowerman (1996). Spanish *en*, English *in* and Korean *kkita* convey control at different levels of specificity.
- 22 In the development of localization, the evolution occurs mainly by internal lexical formation. In the case of control, some languages might overlook the most abstract notions and immediately establish a connection at the level of more specific concepts. Thus, whereas in the development of localization, a specific preposition (like *au-dessus*) reduces the scope of a more general preposition (like *à*), in the case of control, there is no evidence that a general preposition of control existed at an earlier stage of French, even though *dans* and *sur* specify the Spanish preposition *en*. The more specific prepositions *dans* and *sur*, covering approximately the scope of the Spanish preposition *en*, might have appeared simultaneously, or at least independently, by external lexical formation. This is the reason why the examples illustrating the development of control prepositions in chart 3 are taken from different languages. This does not mean that the expression of control never developed in the same way as the expression of localization. I would like to remain neutral on this point.
- 23 From AT_1 to AT_4 , the extension of the preposition of general localization shrinks each time a more specific preposition appears. The history of languages might support this type of development. Notably, the evolution of the preposition *æt* in Old English illustrates the mode of production by internal formation. Besides the meaning of the present preposition *at*, *æt* could convey (1) the origin of movement; (2) proximity to a living being; and (3) the goal of a movement. It progressively lost these meanings to the profit of the prepositions *with* or *by*, *from* and *to*. The first shift occurred around 1500, the

second in the sixteenth century and the concurrence with *to* lasted until Early Modern English (Lindkvist 1978). This evolution is represented in chart 4.

Chart 4 Evolution of AT

- 24 æt_2 has all the meanings of æt_1 with the exception of the origin ; æt_3 has all the meanings of æt_2 but its landmark cannot be a living being ; and æt_4 ¹¹ has all the meanings of æt_3 with the exception of the goal. In contrast to æt , the French preposition *à* does not leave the introduction of the goal of the target to another preposition.
- 25 A comparison between the case of *en* and *sobre* in Spanish and between *in* and *on* in English might reveal two different modes of lexical creation. In Spanish, one may use the preposition *en* for an object placed on a table, but if the object is placed on a chest of drawers, *sobre* must be used instead of *en*. Indeed, using the latter preposition would imply a reference to the interior of the drawers, as a preferred option. To avoid the confusion with the objects contained by the drawers, *sobre* must be chosen.
- (4) El libro está en la mesa
 (5) El libro está sobre la cómoda
 (6) El libro está en la cómoda (inside a drawer)¹²
- 26 Therefore a need for clarification pushes Spanish to work with two prepositions like English. What is different between the two languages is not that Spanish has only one preposition to describe CONTAINMENT and SUPPORT, but that English does not allow one to use *in* when *on* is adequate. The diagrams in figure 2 illustrate the distribution of the prepositions *in* and *on* in English and of the prepositions *en* and *sobre* in Spanish.

Figure 2 Distribution of prepositions in English and Spanish

- 27 To be accurate, the schema describing *in* and *on* requires an intersection since, in some cases, speakers hesitate between these two prepositions to describe the same situation. Whereas schema (A) is compatible with external lexical formation, in which *in* and *on* are directly attached to support and containment, schema (B) is a case of internal lexical formation at its first stage. This means that *sobre* has not reached the stage in which it would prevent *en* being chosen when the conditions for the use of *sobre* are met. This preposition is preferred to *en* only in the cases in which an ambiguity must be avoided.
- 28 In the case of *in* and *inside*, morphology shows that the formation of *in* is likely to precede the formation of *inside* since it is much easier to imagine the addition of *side* to *in* than to build *in* from *inside* by truncation. Whereas *in* can be used for the interior of closed containers (sentence 7a), for the interior of open containers (sentence 8a), for the material of containers (sentence 9a) and for masses (sentence 10a), *inside* can only be used in sentences (7b) and (9b) :
- (7) a. The jewels are in the box
 - b. The jewels are inside the box
 - (8) a. The wine is in the glass
 - b. *The wine is inside the glass
 - (9) a. The termites are in (the wood of) the cupboard
 - b. The termites are inside (the wood of) the cupboard
 - (10) a. The fish is in the water
 - b. *The fish is inside the water
- 29 Therefore, *inside* may be considered as a hyponym of *in*. I am not aware of examples in which *inside* must be used instead of *in* in order to avoid ambiguity, as was the case for *sobre* and *en* in Spanish. As long as this need is not felt by the speakers, a split of *in* and *inside* similar to the split of the category “grue” in *green* and *blue* has not occurred. Hyponymy, then, does not necessarily lead to separation. Therefore, IN_1 does not correspond to IN-2D and IN-3D except those cases in which INSIDE can be used, as it is suggested in chart 2. I conclude this section with other discrepancies between chart 2 and the analysis proposed in chart 3.
- 30 According to the analysis of Levinson and Meira, IN-3D (containment) and IN-2D (inclusion in a plane) appear simultaneously at the second level of abstraction. The first notion implies the control of the target by the landmark whereas the second notion localizes the target in a two-dimensional landmark. The interaction occurs between two material entities in the former case while the landmark is a spatial entity in the latter case. In chart 3, IN-3D corresponds to CONTAINMENT. The notion corresponding to IN-2D

should be in the LOC part of the chart and, indeed, an important function of LOC₃, conveyed by *à* in French is to locate a material entity (Jean) or a spatial entity (Montmartre) in a spatial entity (Paris) :

(11) Jean est à Paris

(12) Montmartre est à Paris

- 31 As a matter of fact, the contrast between a material landmark and a spatial landmark might determine the difference between IN-2D and IN-3D better than the contrast between two-dimensional and three-dimensional. Indeed, the dimensionality of a spatial entity is a matter of conceptualization and the two-dimensional wood in sentence (13) looks rather three-dimensional in sentence (14) :

(13) The rabbits play in the wood

(14) The birds fly in the wood

- 32 Interestingly, English uses *in* to translate (11) and French uses *en*—coming from the Latin preposition *in*— in front of feminine country names as well as in front of masculine country names beginning with a vowel :

(15) John is in Paris

(16) Jean est en France

- 33 Further hesitation between *at* and *in* to locate a target in geographic entities appears in the development of English. Indeed, whereas *in* was used for this function in Old English, *æt* introduces countries and large areas in Middle English and survives in Early Modern English to disappear in the nineteenth century (Lindkvist 1978). In order to explain these variations, I would like to claim that chart 3 captures only the prototypical values of the basic spatial prepositions. According to my analysis of *dans* ('in'), the first function of this preposition is the representation of the relationship CONTAINER/CONTENT (Vandeloise 1994, 2005). It accounts for the initial value of *in* in chart 3. From this initial value, *in* develops different meanings that can be more or less close to the prototypical value of other basic spatial preposition in the chart (Vandeloise 1995). Thus, what Levinson and Meira call IN-2D might be a later development of IN-3D. Whereas the landmark in IN-3D is a material entity with boundaries that allow physical control of the target, the landmark of IN-2D is a spatial entity. Spatial entities may have determinate boundaries—think of countries!—but they are virtual rather than material. Therefore, like *à* in French, IN-2D orientates itself toward localization and may compete with AT₂. Even with a spatial landmark, however, the French preposition *dans* keeps the memory of its first function. Compare sentences (17) and (18) :

(17) ?Hans est dans Paris

(18) Les soldats sont dans Paris

- 34 Whereas sentence (17) looks odd, the use of *dans* in sentence (18) is perfect because the idea of a conflict evoked by the soldiers makes control more salient.¹³
- 35 Two notions introduced in the analysis of Levinson and Meira—UNDER and OVER—do not appear in chart 3. Numerous studies have been dedicated to *over* (Lakoff 1987, Brugmann 1988, Dewell 1994, Tyler and Evans 2001, Deane 2005). In contrast to Tyler and Evans, Dewell (1994) treats this preposition as a path preposition. This would be a sufficient condition to ignore *over* in a chart devoted to static spatial prepositions. One may also doubt whether this preposition belongs to basic prepositions since, besides English, Levinson and Meira do not mention another language with the category OVER. Brugman (1988) and Lakoff (1987) associate *over* to *above* and *across*. In fact, the two pictures illustrating OVER in Levinson and Meira's data might as well be described by

above. However, in the analysis of Levinson and Meira, the link of *over* with *above* is ignored and OVER is considered as a notion that confines the scope of ON₂ in languages like English, in the same way as ATTACHMENT does for languages like Dutch.

- 36 Like OVER, UNDER has a particular status in chart 2 since it is introduced simultaneously with ON₁. As with IN, UNDER can convey control between two material entities when there is contact (sentence 19), or localize a target relative to the landmark (sentence 20) :

(19) The red book is under the yellow book

(20) The shoes are under the table

- 37 *Under* looks like a converse of *on* in sentence (19) since this sentence implies that the yellow book is *on* the red book.¹⁴ However, as illustrated by sentence (20), the converse relation between *on* and *under* is not as complete as the converse relation between the projective prepositions *in front* and *in back*. It would be easy to integrate *under* in chart 3. Its first meaning might be introduced below SUPPORT, in the same way as the prepositions *au-dessus* and *en dessous* are introduced below VERTICAL SEPARATION.

Chart 5 Incorporating *under*

- 38 The meaning of *under* in sentence (20) might then be considered as an extension of its meaning in sentence (19) (Vandeloise 1991: chapter 12), just as IN-2D may be an extension of IN-3D. Compared to chart 2, this alternative presents the advantage of justifying the simultaneous introduction of *on* and *under* by their common relationship to SUPPORT. However, this might suggest too strong a connection between *on* and *under* and I will ignore the notion UNDER in chart 3.

3. Three modes of development

- 39 The implicational scale of Berlin and Kay for the basic terms of colors describes the order of appearance of these terms in the formation of languages. With the assumption that languages evolve from little sets of words to their complete lexicon, one may assume that a language with a system of seven basic color words is more evolved in this domain than a language with a system of five words. When the new terms occur through internal lexical formation by division, the development of languages can only go from the top to the bottom, i.e. from the most general terms to the most specific ones. If only internal lexical formation were involved in the creation of spatial terms, the same conclusions might be drawn for the typology of Levinson and Meira in chart 2 and for the conceptual hierarchy proposed in chart 3. This means that Korean would be a development of English, itself a

development of Spanish. But then, *in* and *on* in English should derive from a word conveying the same situations as *en* in Spanish, just as *green* and *blue* are created by the split of the category “grue”. And *kkita* and *nehta* in Korean would be created by internal lexical formation from a word with a larger distribution corresponding to English *in*.¹⁵ If we do not have evidence in the history of English and Korean for such a development, this may simply mean that the formation of spatial terms is not parallel to the formation of basic color terms, and that there are different modes of genesis of spatial terms. Indeed, besides internal lexical formation, external lexical formation plays a role in their creation. In this case, *in* and *on* in English, as well as *kkita* and *nehta* in Korean, do not have to be the result of the split of a larger category. They may have been created separately because the speakers of these languages attach a communicative virtue to the categories represented by these words.

- 40 With external lexical formation, the first spatial terms can appear at any level of generality in the hierarchy proposed in chart 3. Whereas Spanish might attach *en* directly to control, English may attach *in* to containment and Korean can associate immediately *kkita* to tight fit. The process of internal lexical formation proposed by MacLaury proceeds by division : a larger category “grue” is replaced by two more specific categories designated by *green* and *blue*. This type of formation, therefore, can only go from the top to the bottom of the hierarchy. But, if some languages create words at a high degree of specificity by external lexical formation, there may be a different type of internal lexical formation going from the bottom of the hierarchy to the top. Besides *internal lexical formation by division*, then, there might be a mode of *internal lexical formation by union*. This mode of formation is internal because it relies on the existence of two more specific words. In contrast to internal lexical formation by division, however, internal lexical formation by union goes toward the top of the hierarchy. It can begin from the bottom of the hierarchy, with the most specific terms, or in the middle with intermediary notions. With these three modes of lexical formation, the developments illustrated in chart 6 are logically possible in languages.

Chart 6 A hierarchy of formation of spatial terms

- 41 In the case of schema (A), the creation of spatial terms begins with RELATIONS IN SPACE, a concept that gathers LOC and CONTROL. Schema (B), beginning in the middle of the hierarchy, is very reminiscent of the relationship between basic categories, supercategories and subcategories proposed by Rosch (1973). One goes from basic categories to supercategories by abstraction and to subcategories by specification. Schema (C) goes from the most concrete concepts to the most abstract.
- 42 Which of schemas (A), (B) and (C) is dominant in the creation of language? Schema (A) is illustrated by the development of basic color terms proposed by MacLaury in chart 1, in which the number of words increases from the top to the bottom of the hierarchy. The implicational scale of Levinson and Meira suggests a similar development for spatial terms. One may also surmise that languages have fewer words at their beginning than when they are fully developed. This parallelism pleads in favor of schema (A). Other arguments, however, show that schema (C) has a dominant role in the creation of languages. Indeed, Lévy-Bruhl (1922) claims that “primitive” thought is characterized both by its concreteness and the absence of general concepts. For example, many Amerindian languages do not have a general term for walking but they have many more specific verbs that specify the direction, the trajectory or the manner of walking. According to Merleau-Ponty (1945), Maoris have 3000 terms for colors, not because they distinguish numerous colors, but because they do not recognize the same color when it belongs to different objects and use different words for it. Concrete specific concepts, then, might be at the origin of many words. As far as schema (B) is concerned, numerous experiments in cognitive psychology by Rosch and her colleagues (1975) demonstrate the preponderance of basic categories over subcategories and supercategories. If one may recognize basic categories in the middle of chart 3, this might plead for schema (B). CONTAINMENT and SUPPORT, then, should be more prototypical notions than CONTROL and TIGHT FIT or ATTACHMENT. Experiments by Choi et al. (1999) cast some doubt about the predominance of CONTAINMENT over TIGHT FIT. Indeed, English infants demonstrate

more interest in the latter relation than in the former. If TIGHT FIT were universally dominant, Spanish children should begin their journey in language by limiting the use of *en* to the most specific contexts before enlarging its distribution to CONTROL. As far as attachment is concerned, Levinson and Meira found that many languages consider it a central topological notion. An explanation for this predominance might be that, with the exception of fruits attached to trees, ATTACHMENT is mainly an artificial way of stabilizing the target. This is in contrast to CONTAINMENT and SUPPORT that occur frequently in the nature. ATTACHMENT, then, would contrast with all the natural spatial relationships.

4. Language acquisition

- 43 At the beginning of the nineteenth century, “primitive” thought was often compared to the thought of children (Lévy-Bruhl 1922). In this way, ontogeny, the acquisition of one language by one child, would reproduce phylogeny, the creation of a language by a civilization. However, there is an obvious difference between language creation and its recreation by the child since, in contrast to the community that must begin a language from scratch, the child is immediately confronted with a completely developed language. Furthermore, whereas the creation of a language requires production, children first learn a language through understanding and reproduction. In this section, I will first attempt to understand how the acquisition of a language without the help of a pre-linguistic conceptual system could occur. This eventuality appears very unlikely. Therefore, in the second part of this section, I will evaluate the incidence of schemas (A), (B) and (C) and of the pre-linguistic concepts in chart 3 on the acquisition of different languages.
- 44 An extreme form of determinism claims that no structured thought can exist without language. Therefore, only language can help to learn language. However, the first use of a word *W* by a child must be triggered by a situation in the world to which he associates *W*. Since, by hypothesis, the concept corresponding to the word *W* does not exist before *W* is acquired, its association with the situation must be referential or indexical. At the time of anchorage, the knowledge of the word is, of course, very tentative. Language can help to develop the full knowledge of the word in two ways. First, when the word *W* is used for a new situation in which the child would not have used it, he knows that his language establishes a connection between this situation and the other occasions on which he uses *W*. In contrast, when a different word is used for a situation in which he would have used *W*, he realizes that his language is sensitive to a difference that justifies the choice of another word. The use of *W* will be underextended as long as the child does not know all the relevant similarities and overextended as long as he does not know all the relevant differences.
- 45 The strength of linguistic determinism depends a great deal on the nature of the connections language reveals to the child. Indeed, if they are based on similarities and differences recognizable in the extra-linguistic situations, language does not so much create the concept associated to the word as it guides the child through an array of differences and similarities available in the world. In this case, at each stage of the development of his acquisition of a word, the child has expectations that correspond to his knowledge of the word. Does the final stage corresponding to the complete acquisition of the word —if there is such a thing— have a special linguistic flavor that singles it out from the preliminary stages ? I would rather guess that there is a continuum going from

the anchorage situation to the final stage of knowledge. In this case, there may not be a clear-cut distinction between the established “linguistic” concept and its elaboration.

- 46 If determinism is rejected and pre-linguistic concepts¹⁶ are admitted, how can the acquisition of words expressing containment in languages like Spanish, English and Korean help us to understand what they are? Since these concepts are pre-linguistic, they are independent of language and can be shared by the infants speaking each language.¹⁷ For example, a Spanish child could be receptive to the notion of TIGHT FIT (associated to *kkita* in Korean) and a Korean child could be sensitive to CONTROL (associated to *en* in Spanish). In this way, there might be a common set of pre-linguistic concepts shared by all the children in the world. On the other hand, children might have different pre-linguistic conceptual systems, even among children learning the same language. For example, there might be concrete-minded Spanish boys ready to anchor *en* to TIGHT FIT whereas other boys, more abstract-minded, would associate it directly to CONTROL and others, in the middle, would associate *en* to CONTAINMENT. As a result, these children should use different schemas in order to reach a complete knowledge of *en*: concrete-minded boys should use schema (C), going from the concrete to the abstract, whereas abstract-minded boys would get an almost immediate knowledge of the distribution of the word. In this way, schemas (A), (B) and (C) constitute the most economical ways of learning Spanish, English, and Korean respectively, since the concept corresponding to the level of abstraction chosen by these languages would be acquired directly. I do not have empirical data answering this question. They would be very helpful to choose between the existence of a common universal set of pre-linguistic concepts on the one hand, and the existence of individual variations in the acquisition of spatial terms on the other hand. Spanish infants underextending *en* to TIGHT FIT or to CONTAINMENT, for example, would provide strong evidence for these pre-linguistic concepts since these underextensions cannot be justified by their language. The same thing would be true for English infants limiting the use of *in* to TIGHT FIT.
- 47 Schema (C), proceeding from the most specific to the most abstract concepts, might be built entirely conceptually, without the help of language, by the child who recognizes the commonalities between TIGHT FIT and LOOSE FIT, and afterwards between CONTAINMENT and SUPPORT. In this way, a child going through this process of generalization would have the three pre-linguistic concepts at his disposal before he begins to acquire his language. It is very easy, however, to see how language can contribute to the building of these concepts. Indeed, suppose that an English child underextends the meaning of the preposition *in* and restricts its use to the representation of TIGHT FIT. He will quickly realize that adults are also using the same word for LOOSE FIT. Therefore, he will be inclined to look for similarities that he might otherwise have overlooked. In this case, one might say that language is a necessary condition, if not a sufficient one, for the constitution of concepts. A Spanish child who would underextend the meaning of the Spanish preposition *en* and associate it with TIGHT FIT or CONTAINMENT would also receive plenty of warnings from adult language until he extends the use of the preposition *en* to CONTROL, which embraces the whole extension of the preposition in adult language. Korean children, in contrast, will not find in their language any incentive to extend TIGHT FIT to CONTAINMENT or to CONTROL. A Spanish child who underextends *en* will correct himself more easily than a Korean child who overextends *kkita* since the former will receive positive evidence (each time he hears *en*

used in circumstances he was not using it), whereas the Korean child will only receive negative data (when adults correct him if he uses *kkita* inappropriately).

5. Conclusion

- 48 The genesis of basic colors (Berlin and Kay 1969, MacLaury 1991) provides hints to better understand the genesis of spatial terms. Two modes of internal lexical formation inside the language system (by division and by union) have been opposed to external lexical formation that attaches words directly to extra-linguistic notions of utmost importance in the linguistic community.
- 49 Before presenting my views on the genesis of spatial terms, I have discussed the analysis of Levinson and Meira (2003). They exclude projective prepositions from their investigation because, according to the authors, these prepositions belong to a different subsystem. The development of spatial terms begins with an all-encompassing adposition AT covering all the relationships in space. In chart 2, the system enriches itself through internal lexical formation by division. The new notions introduced are mainly topological basic categories like ON/OVER (superadjacency with or without contact), UNDER (subadjacency with or without contact), NEAR (proximity). IN-3D (containment) and IN-2D (inclusion in a surface) are also notions proposed in the analysis, even though I believe that containment is a dynamic notion rather than a topological one. According to my proposition, the dichotomy between CONTROL (a general dynamic notion) and LOC (a general topological notion of localization) constitutes the first step in the genesis of spatial terms. As illustrated by the preposition of Old English *æt*, this part of the system evolves essentially by internal lexical formation by division. In contrast to Levinson and Meira, I have introduced the projective notions. As far as the dynamic spatial system is concerned, different levels of specification may be observed in different languages. For example, the Spanish preposition *en* represents a general notion of CONTROL whereas the English prepositions *in* and *on* convey more specific notions of CONTAINMENT and SUPPORT. No historical data show that this enrichment occurs by internal lexical formation by division, which means that IN and ON might occur by external lexical formation. In this case, the comparison of the different levels of abstraction cannot be done inside one and the same language but requires a comparison between different languages.
- 50 As far as color terms are concerned, one may consider that languages with more specific terms are a development of languages with more general terms according to schema (A) in section 3. If language creation was proceeding by internal lexical formation only, one might draw the same conclusion for spatial terms related to containment in chart 3. But external lexical formation may attach a word directly to different levels of abstraction. Such is the case for natural kinds like dogs and birds. Nouns in basic categories are considered more prototypical than nouns for supercategories and subcategories and are acquired first. The creation of these words conforms to schema (B) : supercategories and subcategories develop from basic categories by abstraction and specification respectively. Finally, according to Lévy-Bruhl, human thought at its beginning evolves from the concrete to the abstract, according to schema (C). This schema would give precedence to the most specific basic terms.
- 51 In the last section of this article, I investigate how the acquisition of language might help to provide clues about the development of spatial terms. How do children adjust to the

level of abstraction of control terms in the language they are learning : general like *en* in Spanish, intermediary like *in* and *on* in English or specific like *kkita* in Korean and *aan* in Dutch ? Any discrepancies between child and adult language, as well as the adjustments children are making to reach a complete command of spatial control terms, may be helpful to understand the genesis of language. Three extreme —and much caricatured— avenues may be proposed. First, the *universal view* : before speaking, all the children in the world first pay attention to the same concepts and, afterwards, adjust to their language through schemas (A), (B) or (C). Second, the *relativist view* : after a period of passive understanding, children are immediately tuned to the level of abstraction that characterizes their language. And finally, the *individualistic view* : even in a single language, different children make different hypotheses and reach the command of control terms by different ways. It might be useful to keep the three possibilities in mind when we analyze any data that might be relevant for the genesis of language.

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NOTES

1. This paper is a slightly revised version of C. Vandeloise's chapter published in 2010 in V. Evans and P. Chilton (Eds.), *Language, cognition and space : the state of the art and new directions*. London : Equinox, 171-192. © Equinox Publishing Ltd 2010
2. According to MacLaury, the category of warm colors splits before the category of cool colors and *red* appears in third position because the perceptual difference between red and yellow is more conspicuous than the contrast between green and blue.

3. “Relevant sort” might only have a specific sense if there was a consensus about the central meanings of these prepositions, which is far from being the case.
4. *Topology* here has not a mathematical meaning but refers to static common sense relationships in space, such as neighborhood and inclusion, as used in Piaget and Inhelder (1956).
5. Levinson and Meira do not need to be concerned by verbs since they explicitly limit their analysis to adpositions.
6. Maybe the authors consider that *on* appears simultaneously with its converse *under*. However, in language acquisition, *under* is understood much later than *on* (Rohlfing 2003).
7. If the tablecloth covers the table entirely, its situation would be described in English by *the tablecloth is over the table* rather than by *the tablecloth is on the table*.
8. For some spatial relationships, like the situation described by *the sun is above the earth* or *the airplane is over the house*, proximity of the two material entities is not a necessary condition. In these particular cases, however, accessibility may be obtained by the rays in the case of sun or by bombs (or landing) in the case of the airplane.
9. Adpositions marking control may help to locate the target but they do it only indirectly. A sentence like *the wine is in the glass* is used to indicate that the wine is available for drinking—as opposed to *the wine on the floor*. French children are well aware that the preposition *dans* conveys localization only indirectly when their answer to the question ‘Where is the King?’ is : *Dans sa chemise* (‘In his shirt’).
10. *Kkita* might also be considered as a specification of *on* when it represents a relation of tight fit between the target and a horizontal landmark. However, these situations are extremely rare since, except for magnetic objects, the pressure exerted by the target on its support is not stronger than its weight. Two horizontal pieces of Lego fitting together are an example of horizontal tight fit. However, *in* might be used in this case, in contrast to *on*, preferred if one piece is simply put on the other, without adjustment.
11. In Early Modern English, *æt* had acquired the modern form *at*.
12. These sentences are adapted from Fortis (2004). Thanks to Ignasi Navarro-Ferrando for comments on these examples.
13. As noted by an anonymous reader, the control here is exerted by the target (*the soldiers*) rather than by the landmark (*Paris*).
14. In French, the phonetic similarity between *sur* and *sous* reinforces the parallelism between the two spatial relations they convey.
15. Even though this hypothesis looks similar to the hypothesis concerning the common origin of *in* and *on* in English, there is an important difference since *in* and *on* are acquired approximately at the same time by children whereas *kkita* appears to be learned earlier than *nehta* in Korean. These two words, then, do not have the same status in acquisition.
16. Tye (2000 : 176) speaks of “perceptual concepts” that are “a matter of having a stored memory representation that has been acquired through the use of sense organs and available for retrieval, thereby enabling a range of discriminations to take place”.
17. Society can introduce differences in the set of pre-linguistic concepts independently of language. This is the case for societies that have no containers or societies that have only round symmetrical objects.

ABSTRACTS

The genesis of basic colors provides hints to better understand the genesis of spatial terms. The two modes of internal lexical formation (by division and by union) inside the language system can be opposed to external lexical formation that attaches words directly to extra-linguistic notions of utmost importance in the linguistic community. After discussing the analysis of Levinson and Meira on genesis of spatial terms, I present my own views on this issue. According to this proposition, the dichotomy between CONTROL (a general dynamic notion) and LOC (a general topological notion of localization) constitutes the first step in the genesis of spatial adpositions. As illustrated by the preposition of Old English *æt*, this part of the system (LOC) evolves essentially by internal lexical formation by division. As far as the dynamic spatial system is concerned (CONTROL), different levels of specification may be observed in different languages and this suggests a mechanism of external lexical formation. Three modes of development of words are highlighted in the following section, two of which —beginning in the middle or in the bottom level of the hierarchy of words and concepts— are clearly related to external lexical formation. In the last section of the paper, I investigate how the acquisition of language might help to provide clues about the development of spatial terms.

La genèse des couleurs de base fournit des indications pour mieux comprendre l'émergence des termes spatiaux. Les deux modes de formation lexicale interne (par division et par union) à l'œuvre à l'intérieur du système de la langue peuvent être opposés à la formation lexicale externe qui rattache directement les mots à des notions extralinguistiques de première importance dans la communauté des locuteurs. Après une discussion du scénario avancé par Levinson et Meira pour la genèse des termes spatiaux, je présente mon propre point de vue sur cette question. Selon cette proposition, la dichotomie entre CONTROL (notion dynamique générale) et LOC (notion topologique générale de localisation) constitue la première étape dans l'émergence des adpositions spatiales. Comme illustré par la préposition *æt* du vieil anglais, cette partie du système (LOC) évolue essentiellement sous l'effet de la formation lexicale interne par division. Concernant le système spatial dynamique (CONTROL), différents niveaux de spécification peuvent être observés selon les langues et ceci suggère un mécanisme de formation lexicale externe. Trois modes de développement des mots sont mis en évidence dans la section suivante, dont deux —débutant au milieu ou au bas de la hiérarchie des mots ou concepts— relèvent clairement de la formation lexicale externe. Dans la dernière section de l'article, j'envisage comment l'acquisition du langage pourrait fournir des indices sur le développement des termes spatiaux.

INDEX

Keywords: basic color terms, spatial terms, internal lexical formation, external lexical formation, control, localization, genesis of spatial adpositions, acquisition

Mots-clés: termes de couleurs de base, termes spatiaux, formation lexicale interne, formation lexicale externe, contrôle, localisation, genèse des adpositions spatiales, acquisition

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