WHY *SPACE IN LANGUAGE*? THE REASONS FOR A MEETING

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1. THE EVENT

Last autumn, an International Conference on *Space in Language* was held in Pisa. The event was promoted by the Ph.D. Programme in Linguistics and hosted by the Department of Linguistics of Pisa University.

Why a conference on *Space in Language*? In general, a meeting is a good glue for establishing and strengthening the scientific relationships among people working in similar areas of research; at the same time, it can become a way to have direct contact with other people working in the same field, with the aim of sharing different hypotheses and empirical data. In particular, the topic of our conference appears to be a perfect humus for interdisciplinary research, since the study of spatial language has already produced a lively theoretical debate, in both cognitive science and linguistics. The huge quantity of empirical results has provided evidence of both language-specific and universal features reflected in human thinking and speaking. The revival of Sapir-Whorfian ideas on the relationship between language and culture has found in space a fertile ground for the development of new relativistic paradigms.

In spite of the rich bibliography produced in the last few years, we believe the subject has yet to offer many suggestions for developing useful, innovative lines of research. The conference *Space in Language* aimed to focus on the present status of research in this field. Current interest in the topic of space and spatial categories in language and cognition was confirmed by the *STALDAC* conference held in April 2010 in Cambridge (*Space and Time across Languages, Disciplines and Cultures*, see *www.cilr.cam.ac.uk/staldac*).

In our conference, we desired to sum up the present status of studies on the representation of spatial categories in the language faculty and in human languages. Furthermore, as the event was promoted and sponsored by the Ph.D. Programme in Linguistics, the first target was to promote the meeting of young scholars

working on that topic around the world.

At the same time, given our wish to promote an interdisciplinary meeting, we decided to invite some of the most widely recognized experts in the study of space, and its relation with cognition and language, covering different areas of research, i.e. linguistic and typological theory (Leonard Talmy), psycholinguistics (Barbara Landau), historical linguistics (Domenico Silvestri), neurolinguistics (Pietro Pietrini), linguistic typology (Giuliano Bernini), and cognitive neuroscience (Laila Craighero).

2. SPACE AND LANGUAGE

Space and its encoding in human languages represent a classic topic in the domain of the complex interaction between language and cognition. Since the seminal works by Fillmore (1975), Talmy (1983; 1985), Lakoff (1987) and Langacker (1987), the linguistic categories expressing spatial functions, both static and dynamic, have been investigated in several natural languages.

There is no doubt that all animal species have some kind of mental representation of space, i.e. of the location of objects, places and paths among places. These representations derive from special cognitive capacities, which are shared across species – including humans, at least for a large set. However, as Barbara Landau underlined in her contribution to our Conference, only we as humans can also *talk* about space, by telling where things are, how we navigate to find them, where they can be moved, and so on.

In a cognitive view, the spatial dimension is absolutely central; in a parallel way, it cannot be by-passed in the analysis of linguistic structure, either. As human beings, we always interact in a space, for all our life; the space may be natural or social, physical or mental, open or closed, wide or tight, but there is always a space around us and inside us. Space, like time, is a universal category; as such, its representation is embedded in both language and cognition.

The necessary and unavoidable relationship between cognitive representations and external reality constitutes a sort of background against which the spatial linguistic (basically, semantic) categories are construed. If we assume a cognitive approach (see § 3), mental representations and the relative meanings coded by language may reflect reality as it is experienced by human beings. Therefore, our representation of reality appears to be mediated by both the sensory-motor abilities of our bodies, and the mental processes governing the perceptive stimuli. As stated

by some scholars working on the conceptualisation of entities in spatial language (e.g. Herskovits 1986; Vandeloise 1991), *ground* entities in spatial descriptions should be conceived of as geometrical abstractions of real entities, which speakers conceptualise as points, lines, surfaces or volumes. These geometrical abstractions are associated with prototypical functions, which reflect how objects act in the world out there, and how we interact with them.

Which spatial categories are coded in languages, how they are expressed *via* language, what relations exist between spatial terms, what kind of constraints – both linguistic and cognitive – hold in the different languages of the world are some of the basic questions that the study of space in language may raise. In parallel, as a result of the close relationship between space and the life of the human being, the categories for encoding the conceptual notions of space into language may shed some light on the way language structure is connected with physical experience and human culture.

A further aspect to be considered is the relationship between cognitive and linguistic representations with specific reference to space. The centrality and the significance of space in language is testified also by the number of spatial metaphors we use in everyday speech (see Lakoff and Johnson 1980). We say that we are *in* a hurry, we may have a lot of problems *in front of* us, we are *up* or *down* with reference to our psychological status, we may go *through* a bad situation, *in* a dialogue we *pass to* a new topic, and so on. Our metaphors normally start from the physical, concrete domain of perception, and develop new meanings, conceptual and more abstract. Even in the case of space, the path of metaphor is the same: from the concrete location of an object or entity in a space, we derive the abstract notion of location, in mental or psychological terms. And language allows this extension; for instance, we can say that the banana is *in* the bowl, just as love is *in* our mind. In a similar way, we use the same linguistic expression relating to the movement of an object or body to refer to the abstract movement of our thoughts; for instance, in a sentence like: *we now move on to an analysis of the economic situation*.

In conclusion, space is clearly a core domain of human cognition. However, the thorny problem is: are the cognitive categories of space derived from language? or, vice versa, do the linguistic expressions for representing space derive from the cognitive categories relating to space? More generally, we may ask whether the two systems of representation – cognition and language – are distinct, or only superficially different. The study of space may offer useful support in the task of understanding how language is grounded in space and in our sensory-motor experience.

3. COGNITIVE PARADIGMS

In cognitive linguistics, a long-standing debate exists between alternative models of the relationship between language and concepts. Within this debate, a special place is devoted to spatial language: on the one hand, the structures of spatial language appear to be determined by our pre-linguistic categorisation of space (see Lakoff 1987; Jackendoff 1983; 2002); on the other hand, various scholars have claimed the existence of a reversed causal relationship, such that the structure and the lexicon of spatial language constrain the shape and the categories of "spatial thought" (see Levinson 2003; Levinson and Wilkins 2006; however, Sapir was already following the same line of research).

With reference to sensory experience, there are two different hypotheses in cognitive sciences about the nature of conceptual structures and semantic representations:

1. The *Embodied Cognition Hypothesis* (ECH), according to which conceptual content is reducible to sensory-motor information; see, for instance, Barsalou (2003), Gallese and Lakoff (2005), De Vega *et al.* (2008);

2. The *Abstract Concept Hypothesis* (ACH), according to which concepts are abstract, symbolic entities, which cannot be reduced to sensory-motor information, although they are related to it; see, for instance, Mahon and Caramazza (2008).

The major matter of contending between these two models is the kind of semantic representation of lexical terms (both nouns and verbs) referring to concrete and space-temporally determined entities. In the ECH, concepts are viewed as concrete, and anchored to the perceptive experience of our body; abstract concepts are in some way secondary in our cognitive representation, and derive from metaphors grounded in the sensory-motor system. On the other hand, in the ACH, mental representations may be abstract in origin; they collect and integrate different kinds of information: linguistic, perceptive, sensory-motor, emotional.

The same information arising from the linguistic structure may be considered more or less relevant for the construction of semantic representations: in the ECH, linguistic information, whatever it is, plays a marginal role, whereas what is crucial is the sensory-motor grounding; in the ACH, language is the source of meaning; it is related to, but autonomous from, the perceptive experience.

Lexical terms encoding space correspond to semantic representations, which can be conceived of as more or less embodied; for instance, if we use the verb *to enter*, we are recalling the image of a body moving in a specific way, with respect to a specific frame; this frame consists of physical, as well as cognitive and linguistic experience.

The semantic analysis of spatial language may provide new insights into the important relationship between conceptual structures and sensory-motor information, and more in general, into the relationship between language and experience.

4. LINGUISTIC ISSUES

In parallel, a theoretical debate about the role of cognition and language in the expression of spatial categories has existed for many years. Nativistic approaches compete with functionalist and relativist ones. The debate has recently been synthesized by Barbara Landau in the dichotomy *Space First* versus *Language First* (cf. Landau 2010).

According to the former hypothesis (see, for instance, Jackendoff 1983; Landau and Jackendoff 1993; Landau 1994; Talmy 2000a, 2000b; Li and Gleitman 2002), there is a restricted list of primitive, universal and innate topological notions, shared by all human beings, and coded more or less directly by adpositions or verbs.

On the contrary, the relativist/functionalist approaches (Brugman 1983; Brugman and Lakoff 1988; Herskovits 1986; Lakoff 1987; Cuyckens 1991; Vandeloise 1991; Levinson 2003; Bowerman and Choi 2003) assume that spatial language is conditioned in several ways and to several degrees by cultural conventions, and reflects representations created by exposure to spatial words relating to one's native language.

From the linguistic point of view, we may say that we already know what the basic elements are that govern the structure of the spatial lexical repertoire found across spoken languages.

First of all, we should recognize that the system of spatial categories shows a closed, relatively short inventory of fundamental spatial features, which form the basic components of the spatial system, in its paradigmatic order, as well as in its combinatory constraints; the work done by Leonard Talmy (see, for instance, Talmy 1991; 2005) has clearly emphasized this important aspect. It is worth recalling here that some studies, carried out by scholars such as Talmy himself

(1983), Levinson and Meira (2003) and Brown (1994), on some exotic languages have shown the occurrence of terms encoding quite a large number of spatial features very different from those encoded in Western languages.

The features of spatial categories are associated with some word classes, typically verbs, adpositions and adverbs. Information relating to the location or movement of an entity can therefore be encoded by one or more linguistic terms within a sentence; for instance, in the sentence *he is coming to the restaurant*, both verb and preposition give us significant content about the motion event. Structural as well as combinatory constraints produce the abstract schemas of space location and navigation, which belong to the cognitive representations and to the linguistic structure at the same time.

An important question concerns the role of linguistic structures as a source of semantic information, capable of supplementing, or sometimes even replacing sensorial experience. Barbara Landau (in this volume, too) claims that language itself enriches our sensorial representations, increasing the power of our representational structures, although spatial language depends on our pre-linguistic experience. In general, it seems to be reasonable to think that the linguistic context of words has a significant role in characterizing their semantic identity. The fact that linguistic input is rich enough to provide a semantic grounding for words is consistent with the semantic ability shown by blind subjects: they often use linguistic structures in order to derive semantic representations of terms for which they cannot have adequate sensorial stimuli.

En passant, we would like to suggest that a study of the language of congenitally blind people could shed new light on the power of linguistic structures to become sources of conceptual-semantic representations. As a matter of fact, the language and the conceptual structures of blind subjects inherently have a different experiential basis, since they are not grounded on the visual modality. It seems that congenitally blind subjects show significant similarities with sighted subjects at the linguistic and cognitive levels, even in those semantic domains which at first sight seem to depend more on visual experience (see Landau and Gleitman 1985; Millar 1994; Tinti *et al.* 2006). Therefore, a comparison of semantic representations in congenitally blind subjects with those of sighted subjects might be a good source of evidence in favour of, or against, the *Embodied Cognition Hypothesis* (see Pietrini's contribution in this volume).

In our representation of the world, space occupies a central role. And in language, as in cognition, spatial language becomes a primary source of information. Behavioural and neurological findings show that there is a close link

between language and spatial images, as they are construed in our mental representations (see Struiksma *et al.* 2009 and the references quoted there). The fact that blind people are able to navigate, although they lack any visual information about the environment, indicates that space can be represented via different kinds of information, and linguistic information seems to be the most useful. At the same time, as there are some moderate differences between blind and sighted subjects in the creation of spatial images, we may assume a supra-modal representation of spatial mental categories, and a parallel supra-modal organization of the brain (see Cattaneo and Vecchi 2008; Cattaneo *et al.* 2008, Pulvermüller 2008).

In recent literature about spatial categories, another relevant aspect concerns the asymmetry between *Goal* and *Source* paths. This asymmetry, which favours the *Goal* over the *Source*, has been found both in the behaviour of infants, and in the speech of children and adults (see Lakusta and Landau 2005; Lakusta *et al.* 2006, 2007); moreover, it seems to apply to linguistic encoding as well to perception. The *Goal Bias* probably reflects a fundamental aspect of human cognition, which is its forward-looking nature. At the same time, it seems to be effective only in animate intentional events, since normally it is not extended to events that are unintentional in nature, and thus lack a teleological structure, like, for instance, a sheet of paper falling off a table (see Lakusta *et al.* 2007).

In language as well as in non-linguistic behaviour, *Goal bias* and its specular principle, i.e. *Source vulnerability*, appear to be well represented. For instance, *Goal* prepositional phrases are more likely than *Source* prepositional phrases to occur as the only locative argument in a clause. This asymmetry can be explained with reference to a different degree of psychological salience. In particular, in language, as Barbara Landau argues in this volume, these biases might reflect a canonical mapping between syntax and semantics, very similar to the *Agency bias*, whereby agents tend to be mapped into subjects instead of objects.

Source vulnerability has been proved in language acquisition too, for both L1 and L2. In a recent study on the acquisition of spatial prepositions by learners of Italian as L2, we found that *da* "from" is one of the last prepositions acquired: it is often omitted, or replaced by other prepositions, even by advanced learners (Marotta and Meini, in press).

In conclusion, we think that the micro-system of spatial categories, as they surface in natural language, represents a special domain of scientific interest, because it enables us to look inside the cognitive structure of language, and to identify the principles and constraints holding within this specific domain.

5. THE CONTENTS OF THE VOLUME

As the special purpose of the conference was to promote the research activity of young researchers and Ph.D. students in the field of spatial categories in human languages, the spectrum of the topics included in our conference was very wide, ranging from the cognitive aspects of spatial categories to their typological aspects in the languages of the world, from the lexicon of space to grammaticalisation processes, from neuro-cognitive evidence about the representation of spatial categories to L2 acquisition.

The volume includes all the presentations given at the Conference. As a matter of fact, we carried out a rather fine-grained selection before the event. We received more than 70 abstracts, which were reviewed anonymously by at least two members of the Scientific Committee. The conference programme thus already represented a stringent selection of authors. At the same time, with the aim of favouring the sharing of materials and methods among people working on the same topic, we decided to publish all the papers selected, without any discrimination between oral presentations and posters.

The volume is divided into four parts, which are preceded by the contributions of the invited speakers. Part I includes papers related to the representation of spatial categories in the brain, including linguistic deficits showing special behaviour in the spatial dimension (e.g. the Williams Syndrome, a rare genetic deficit that gives rise to a cognitive profile of profoundly impaired spatial representations). Part II presents the contributions concerning spatial categories in ancient languages, taking also into consideration their change over time. Part III shows the topic of space from a more typological point of view; here modern Western languages are discussed, besides Eastern languages, like Chinese and Japanese, with a glance at Arabic. Finally, part IV concerns the use of spatial terms in Second Language acquisition.

As far as the invited speakers are concerned, Giuliano Bernini presents a fine contrastive analysis of the lexicalisation strategies of motion events in Italian, Modern Arabic and an Italo-Romance dialect. On the basis of the recent reassessment of Talmy's typology proposed by Beavers *et al.* (in press), the original binary distinction between two major types of languages, called satellite-framed languages and verb-framed languages, proves to be too rigid, since constructions of both types are shown to occur in the languages considered.

The choice and distribution of the two lexicalisation strategies in relation to manner and path verbs is closely related to the range of potential patterns allowed

by the grammatical structure of available words, and by the way they are organized into word classes in the lexicon. For instance, in Italian, lexicalisation patterns appear to be governed by the unaccusativity of the verb. Pragmatic constraints are also shown to be relevant in the choice of the lexicalisation strategies of motion events: the data discussed seem to indicate a closer correlation between the type of lexicalisation and the spoken mode on the diamesic dimension of language variation.

Laila Craighero focuses attention on the close link between space, movement and motor system, from the perspective of the most recent research on mirror neurons (cf. Rizzolatti and Craighero 2004). Recent empirical data show that the ventral pre-motor cortex in both humans and monkeys has motor and cognitive functions; in particular, it is part of a series of parieto-frontal circuits, working in parallel, involved in space coding. The coordinate frame in which space is coded depends on the motor requirements of the effectors that a given circuit controls.

Given this close link between space coding and action programming, the capability of selecting a particular stimulus in space results from an internal representation of the required response. Experimental evidence indicates that attention is the final outcome of the processing performed in the sensory-motor circuits.

Barbara Landau discusses the complex mapping of spatial representations onto language categories. Some asymmetries in the representation of paths in language and cognition are presented, in particular the path types that span manner of motion, change of possession, attachment/detachment, and change of state events. The evidence discussed comes from normally developing children, normal adults, and people with the Williams syndrome: the data coherently show an asymmetry between source and goal expressions, which appears to be a pervasive fact of the linguistic description of events.

Additional evidence suggests that this asymmetry is also a part of our non-linguistic representations, as it appears in non-linguistic tasks among infants, children, and adults. As a whole, the results suggest a homology between spatial language and spatial representation, whose basis is a deep cognitive pressure to "look forward". This pressure results in the homology between spatial language and non-linguistic spatial representation, thereby providing a partial solution to the problem of mapping dissimilar domains onto each other.

Pietro Pietrini and co-authors face the topic of space representation in the absence of sight. Vision has always been considered to be the most important sense for humans in order to acquire experience about their environment. We may

wonder how blind individuals with no visual experience can interact effectively with the surrounding environment. By using functional magnetic resonance imaging (fMRI), a technique that measures brain activity *in vivo* in a non-invasive manner, the authors looked at how the human brain responds while congenitally blind adults perform distinct non-visual tasks. Specifically, subjects were asked to recognize different objects with their hands, localize items in space, or detect the direction of moving stimuli. During these different tasks of tactile perception and recognition, sighted and blind individuals showed similar patterns of brain activation across the temporal and parietal extra-striate cortical areas typically recruited in sighted individuals when they perform visually the same tasks of object recognition, movement perception or spatial localization.

Results indicate that these brain regions show supra-modal features, i.e. they respond to the sensorial information of the stimuli (such as object form, spatial localization, movement direction) independently of the sensory modality – vision or touch – that conveys the information to the brain (cf. Ricciardi *et al.* 2006; Pietrini *et al.* 2009). Altogether, the results of these studies indicate that visual experience is not necessary for the brain to develop its functional cortical organization.

Domenico Silvestri opens his article by quoting the neuroscientist Edoardo Boncinelli (1999): in the study of space in language, the neurostates of optical perception, and their still-unknown relationship with the pyschostates (states of mind) of spatial conceptualisation as expressed in linguistic forms, play a significant role. Then, Domenico Silvestri presents a comparative picture of some spatial linguistic elements in the non-concatenative morphology of the Classical languages and in the concatenative morphology of Sumerian. The comparison is double: terms of expression for "space in the language" and terms of codification for "space of the language". In both cases, the rhythm and the meta-linguistic competence are taken into account to show how an "essential morphology" together with a "minimal semantics" should become the ground for a "grammar of the mind" that linguistic theory should write in the near future.

The data discussed in detail refer primarily to prepositions, with exempla taken from verses by the Latin poets Catullus and Ovid, as well as from the philosophers Heraclitus and Aristotle for Ancient Greek. As is well known, in the Classical languages, as normally in Indo-European languages, prepositions function as spatial indicators in strict relation with their condition of "governors" of case in the following noun; at the same time, the *relatum* is linguistically encoded in the noun governed by the grammatical element. More complex appears to be the expression of spatial terms in Sumerian, where spatial particles can hardly be assimilated to

Indo-European adpositions.

In Leonard Talmy's contribution, a survey of his thought about spatial language is illustrated, having as its centre the spatial primitives holding in language. In this volume we actually re-publish a paper (Talmy 2005), where he discusses his latest reflections on spatial categories and language, which were also presented at the conference. Leonard Talmy underlines the fact that linguistic research has already identified many of the factors that govern the structure of the spatial schemas we can find in spoken languages. According to him, the linguistic system is intrinsically complex and rich, since it comprises several features, working on different levels. At the componential level, there is a relatively closed inventory of fundamental spatial elements, which are universally available, and which form a closed set of spatial categories. Each of these spatial categories includes a small number of semantic features.

At the other levels (compositional and augmentative, respectively), the elements of the basic inventory combine in particular arrangements to form the spatial schemas. For each language, there is a specific, relatively closed set of schemas. Moreover, in the linguistic system, there are some general properties that can change the pre-packaged schemas and enrich the language's particular set of schemas.

We would like to conclude this introduction by highlighting the relevance of interdisciplinary events like our Conference. Space is such a complex topic that it cannot be investigated without adopting a multiple approach: only with reference to different inputs and areas of research may we think of gaining a fuller insight into this subject.

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