The Cognitive Perspective on the Polysemy of the English Spatial Preposition *Over*

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INTRODUCTION

Since the very beginning of their existence, human beings have functioned in space, related to it and tried to manage it in a variety of ways. It is no wonder, then, that space is also ubiquitous in language, the means of exchanging experiences of everyday human life. Speakers use spatial prepositions in order to talk about the place they occupy in the surrounding world, the location of objects in the environment and relations between them. Linguistically, for a long time, spatial prepositions have been regarded as a function or grammatical words with little semantic content. Present advances in cognitive linguistics allow us to have a better insight into the nature of the content expressed by spatial prepositions bringing about the conclusion that prepositions encode rich and diverse information both grammatical and semantic.

The view that spatial prepositions encode complex semantic information is relatively new and not at all widespread. Even when it is acknowledged that the semantics of prepositions is extended, scholars express various opinions on the matter of their categorical status. Radford (1997:45), for instance, considers prepositions as lexical items because they come in antonymous pairs, such as *inside/outside*, just like nouns, verbs, adjectives and certain adverbs. Hagège makes a more moderate claim that prepositions, "elements allegedly belonging to grammar, (…) also belong to the lexicon" (2010:332). Evans (2010) refers to prepositions as *lexical concepts* which suggests a relation with lexemes and a reference to specific concepts or a body of rich encyclopaedic knowledge people have about the world. Other linguists investigating prepositions, such as Lakoff (1987), Brugman (1988), Herskovits ([1986] 2009), Talmy (2000), or Coventry and Garrod (2004), take a more traditional stance on the matter, conceiving of prepositions as closed-class (functional/grammatical) words. An important research endeavour is to discover if the meaning of spatial prepositions is, in fact, rich and complex enough for them to be treated as lexical units rather than only functional ones.

The present work is a continuation of the tradition of research into the nature and the semantic properties of spatial prepositions in general, and of the preposition *over* in particular. One of the earliest works on the semantics of prepositions is Klebanowska's (1971) study of spatial prepositions in Polish. She discusses primary senses of prepositions, geometrical relations between the objects involved, and conditions that have to be met in order for a certain preposition to encode a particular relation. The earliest works involving the preposition *over* in English are Brugman's (1988) and Lakoff's (1987) prototype models of the polysemy of the preposition. Herskovits ([1986] 2009) discusses notions such as normal situation types, ideal meanings, pragmatic factors in the understanding of prepositions and geometric descriptions of objects in spatial relations. Talmy (2000, 2005) elaborates on the geometry of the objects which enter into a spatial relation and formulates categories which apply to the spatial structure of language. Przybylska (2002) presents Polish spatial prepositions in the cognitive perspective, arranging prototypical senses and their extensions into semantic networks. Tyler and Evans (2003) provide a comprehensive study of English spatial prepositions, introduce schematic diagrams to represent spatial relations encoded by the prepositions discussed, and use the notion of pragmatic strengthening to explain how new senses come into being. Coventry and Garrod's (2004) main contribution into the research is the identification of functional elements in spatial scenes.

In the history of linguistic investigation inquiries into the nature of meaning have taken different forms. The cognitive research with its basic assumptions has its predecessor in the nineteenth century. At that time, language was thought to be embedded in the human experience and to store the cognitive categories with which people understand the world around them. Bréal (1897), for instance, highlighted the psychological orientation in semantics and maintained that linguistic meaning is a psychological phenomenon involving the workings of psychological processes. Meanings of words were considered to be psychological entities, that is, kinds of thoughts or ideas, as they constitute personal reflections and reconstructions of experience. One of the achievements of the historical-philological tradition prevailing in the nineteenth century was the introduction of the distinction between the "usual" and "occasional" meanings and of the notion of context. The usual meaning was "the total representational content that is associated with a word for any member of speech community", whereas the occasional meaning referred to "the representational content that an interlocutor associates with a word when he uses it, and which he expects the hearer to associate with the word as well" (Paul 1920:75).

Although the achievements of historical-philological semantics cannot be underestimated as many issues discussed by linguists working in this tradition appear to be present in the contemporary linguistic thought, in the 1930s a new approach to semantics started to emerge. Based mostly on the work of de Saussure, structural semantics set a new direction in the word meaning research (Geeraerts 2010:50). Word meaning was defined as part of the linguistic system and not as part of the psychological life of an individual using the language. A linguistic sign was described in relation to other linguistic signs and its value was determined by the oppositions it entered into with regard to other items. Thus, structural semantics brought with it the shift from semasiology to onomasiology–the scholarly interest addressed the question of how sets of words carve up the world and how they name the reality.

The findings of structuralist semantics were further developed in the tradition of the generative approach to language. In the 1960s, Katz and Fodor attempted to combine a structuralist method of analysis, a formalist system of description and a mentalist conception of meaning (Geeraerts 2010:105-110). The issues crucial for structuralist semantics such as the semantic identity of words, oppositeness of meaning, taxonomical organization and semantic relations between the terms in a lexical field came into focus. At the same time, scholars introduced a psychological element into natural language semantics, concentrating the investigation not on the structure of the language but on the ability of the language user to interpret sentences. Katz and Fodor's research triggered the incorporation of semantics in the formal theory of grammar, which resulted in the formulation of Interpretive Semantics within the mainstream of generative grammar.

Structuralist semantics continued to develop after the introduction of componential analysis into generative grammar. Contemporary structural theories consider the psychological reality of semantic analyses and the adequacy of the formal representations of word meaning as the basic issues to be discussed. One of such approaches is Wierzbicka's Natural Semantic Metalanguage. The model has a decompositional orientation attempting to reduce the semantic description to a set of primitive meaning components and it seeks a truly linguistic, not encyclopedic, level of description (Geeraerts 2010:126-128). The approach implies that the concepts which people have are clearly delineated even though the world is essentially blurry. The theory aims at establishing a set of universal primitive concepts which constitute definitional elements employed to define the meaning of words and rejects the link between meaning and extralinguistic knowledge. This link is introduced by Jackendoff's Conceptual Semantics, where linguistic is complemented with extralinguistic knowledge and where both modules are assigned different tasks (Jackendoff 1996a, Jackendoff 1996b).

In the 1980s, as a result of dissatisfaction with the notion of the autonomy of grammar and the secondary position of semantics in the generative theory of language, cognitive semantics emerged as part of a loosely structured theoretical movement of cognitive linguistics. I believe that the theory offers valuable tools for the investigation into the nature of spatial prepositions. In particular, cognitive semantics considers the meaning of prepositions, as well as meaning in general, a cognitive phenomenon. Meaning is no longer seen as being carried by words, but rather it is seen as emergent when speakers filter the semantic content of individual words in a particular situation of use. It is speakers with their various abilities, both linguistic, cognitive, and, more broadly, psychological, who actually construe the meaning of the message they receive in a sociocultural, physical and temporal setting. Understanding meaning in such an extensive way allows us to explain semantic mechanisms in a much more exhaustive way than it is possible with the tools of traditional linguistics. In what follows, I approach the meaning of the preposition *over* from such a broad perspective, showing that the kind of organisms we have, our experiences and knowledge about the world, contribute to our understanding of the meanings of prepositions. I am also of the opinion that there is a need to continue incorporating the latest findings of the psychological and neurocognitive research into the study of this word class.

One of the assumptions of cognitive semantics differentiating it from more traditional linguistic theories is a maximalist perspective on meaning and the rejection of a clear borderline between semantic and encyclopedic knowledge. In the present investigation, I attempt to demonstrate that vast domains of encyclopedic knowledge can be used in order to arrive at a deeper understanding of the preposition *over*. Extended knowledge about how human beings and other animate and inanimate objects function in space, in what kind of geometrical configurations they can participate, as well as what consequences such geometric relations have for the participants, is needed to explain the semantic structure encoded by spatial prepositions.

The central notions of prototype and categorization find their expression in the description of the polysemy of the preposition *over*. Its distinct senses represent a graded centrality, with the Primary Sense functioning as the prototype of the category and the remaining senses as more or less peripheral members related to the prototype by means of the process of specification or by means of the metaphoric link. The proto-scene, constituting an idealized geometric relation between two objects, suggests the presence of what Langacker (1987) calls the schema. It can be repeated after Brugman (1988) that the preposition *over* reflects the notion of the prototype in two ways. On a higher category level, it contrasts with other higher level categories such as ABOVE or ACROSS, and on a lower category level its various senses represent members of the category OVER. As the act of linguistic categorization rests upon using a particular preposition in relation to a certain spatial, temporal or functional relation between two (or more) objects, the present inquiry can be thought of as a survey of all possible spatial relations to be referred to with the preposition *over*.

In the course of the research, I collected a total of 1095 linguistic items including 708 sentences containing the preposition *over*, 132 compounds with *over* and 255 sentences containing other prepositions used for the grammatical analysis. The present investigation discusses a total of 417 sentences, out of which 162 contain the preposition *over*, and it focuses on spoken and written registers with the exclusion of slang, literary and academic language. The examples come from contemporary dictionaries of the English language such as the *Longman Dictionary of Contemporary English* (2003), the *Oxford Advanced Learner's Dictionary* (2005), *Webster's Third New International Dictionary of the English Language* (1986), *the Free Dictionary*[1], the *Urban Dictionary*[2] and the most reliable *The Oxford English Dictionary* (1989). The sample gathered is analyzed first and foremost in terms of its semantic content but also in terms of the morphology and syntax. I attempt to describe different facets of the preposition *over* and the semantic structure encoded by its distinct senses.

The present study is organized into three chapters. Chapter 1 outlines the theoretical assumptions of cognitive linguistics relevant for the discussion of the spatial structure of language in general and the preposition *over* in particular. Specifically, it focuses on the psychological and cognitive foundations of language, meaning representation in the human mind and meaning construction. The notions of space and shape perception as well as human cognitive abilities such as the identification of image schemas, along with the categorization and formulation of concepts, are closely related to the construal of meaning. Chapter 2 addresses the morphological properties of the class of prepositions, the areas of overlap with other (lexical and grammatical) word classes, the syntactic behaviour of prepositions and prepositional phrases as well as the morphological and syntactic characteristics of the preposition *over*. Chapter 3 discusses the semantic content of the preposition *over*, in particular the geometrical and functional relations holding between objects in the spatial scene encoded by the preposition.

Throughout the book, the terms *trajector* and *landmark*, abbreviated to TR and LM respectively, are used even though the existence of equally frequently used notions of *figure* and *ground* must be acknowledged. The terms *geometry* and *geometrical* were borrowed from mathematics and they relate to the physical characteristics of objects participating in a spatial relation. I also adhere to the traditional distinction between closed and open classes of words calling prepositions interchangeably grammatical, functional or closed-class words without a change in meaning.

Generally speaking, the present investigation demonstrates that the spatial preposition *over* encodes a broad range of geometric and functional relations which form an extended network of meanings. These meanings, well established in the English language and well entrenched in the minds of its speak-

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[1] *The Free Dictionary* (http://www.thefreedictionary.com/Dictionary.htm).
[2] *The Urban Dictionary* (http://www.urbandictionary.com/).

ers, can be used creatively in new situations of use, possibly giving rise to new usages or senses. I believe that the detailed description of the semantic content encoded by the preposition *over* allows us to gain a better insight into the human management of space in particular and the workings of the human mind in general.

CHAPTER ONE

A CONCEPTUAL APPROACH TO LANGUAGE

1.1. Psychological foundations of language

The description of spatial prepositions in the light of cognitive linguistics should first and foremost address the issue of the human perception of space. The perception of space and shape is most relevant to the discussion of prepositional meanings as it segments the reality into more manageable units, the so-called spatial scenes. Space perception rests on the sense of vision; however, it also involves all human senses to a certain degree. This section discusses the mechanisms of the visual perception of space and shape.

1.1.1. Human visual perception

Despite the fact that people are able to recognize surrounding objects and events in the world around them and that they orient themselves in the environment relatively easily, perception of the reality in itself is a complex phenomenon. Psychologists divide perception into three subsequent but interrelated stages: sensation, perception, and the identification/recognition of objects (Zimbardo and Weber 1997). During sensation, physical energy is converted into neural activity which registers information about the type and quality of the stimulation. In other words, the light reflected by objects enters the eye and forms an image on the retina, while the brain registers the sensory information and creates an image of the real objects. In the perceptual stage, a percept is formed in the mind of the perceiver, making it possible to answer the question *What does a given object look like?* A percept is "the internal representation derived from the initial pattern of stimulation and it is this that serves as the basis for subsequent identification processes, i.e. determining what an object looks like, sounds like, smells like, and so on" (Parkin 2002:27). Percepts are attributed with meaning in the final identification/recognition stage. Rectangular objects, for instance, are identified as books, boxes, windows or pictures and the perceiver is, at that moment, aware of various functions the objects can perform. Books can be read, boxes store things, windows can be closed or opened and pictures hang on walls to decorate the interior.

Thus, the process of visual perception begins with a two-dimensional image on the retina and finishes as a three-dimensional scene in which there is depth, colour, movement and other characteristic features. Since perceptual processes gradually add components to a given scene, visual perception is considered reconstructive in nature. Various inferential processes use cues provided by the two-dimensional input formed on the retina to form a visual percept, and, despite considerable distortions in what projects onto the retina, people are able to mentally represent a three-dimensional, constant world.

The reconstructive nature of perception motivated the formulation of several psychological theories, attempting to explain how perceptual processes work. The theories are of two main kinds–bottom-up (data-driven) and top-down (conceptually-driven) theories of perception (Parkin 2002:29, Sternberg 2001). Bottom-up processing assumes that the analysis of data proceeds from lower levels of sensory stimuli to higher levels of cognitive organization, such as past experience, knowledge, memory, language or expectation. In contrast, top-down processing involves a perceiver's higher cognitive processes analyzing lower sensory stimuli in the interpretation of the object of perception at a later stage. For instance, when objects are obscured by other objects or when they are poorly lit, people rely on higher cognitive processes to assign meaning to the sensory information. Usually however, both types of processing are interrelated, enabling us to perceive our environment in a meaningful way.

Sensory information gathered by the retinal receptors must be organized into coherent and structured wholes to contribute to the creation of a meaningful image of the world. The first task of perceptual organizational processes is to segregate the patterns of light and dark encoded on the retina into meaningful regions (Zimbardo and Weber 1997). This segregation rests on the registration of abrupt changes in colour and texture, which signal the boundaries between two regions. Once different regions have been established, they are devided into figures, object-like regions, and grounds, the background against which the figures stand out.[1] The boundaries between the regions are interpreted as edges belonging to the figures, whereas the grounds are seen as extending behind them.

In order to segregate sensory information into figure-ground organization, the visual system performs a perceptual grouping of stimuli, a phenomenon

[1] Contrary to the accepted view that figure-ground organization precedes object recognition, the study of Peterson (1994) indicated that some object recognition processes are conducted before the determination of figure-ground organization and depth segregation.

first studied extensively by Gestalt psychologists.[2] Gestalt laws of perceptual grouping include symmetry, proximity, similarity, closure, continuity, smallness and convexity (Evans and Green 2006, Parkin 2002, Sternberg 2001, Wiegand 2007).[3] Fig.1-1 illustrates the principle of symmetry which holds that people tend to group symmetrical items together. This means that in Fig.1-1 we perceive four sets of symmetrical brackets rather than eight unrelated elements. In Fig.1-2, the circles spaced closer to one another are perceived as belonging together in line with the principle of proximity, which states that, all else being equal, the most proximal elements are grouped together. People also tend to group objects together on the basis of their similarity. In accordance with this principle, we perceive in Fig.1-3 six columns of circles and crosses rather than three rows of 'o-x' sequences. The principle of closure holds that the human perceptual system often completes incomplete figures even in the absence of some perceptual information. The round shape in Fig.1-4 is perceived as complete while, in fact, it consists of four disconnected elements. Similarly, the perceptual system has a preference for continuous figures, which results in the perception of two unbroken rectangles in Fig.1-5, one behind the other, although we can actually see a vertical rectangle and two squares on its sides. According to the principle of smallness small objects are more readily perceived as figures than large objects. In Fig.1-6, we are more likely to perceive a black cross rather than a white cross because the black cross occupies less space. Finally, the principle of convexity illustrated in Fig.1-7 holds that convex shapes are more likely to be perceived as figures than concave ones.

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[2] Gestalt psychologists maintain that human beings have a tendency to perceive any set of sensory elements as segregated into a stable and coherent *gestalt* (shape) and not as disorganized meaningless sensations.

[3] The principles of figure-ground organization presented here are the most widely discussed ones. However, the perception of figures can also be based on other cues. For example, regions with higher as well as lower spatial frequency, regions with a wide base, and regions depicting familiar objects, can be considered figures (Kimachi and Peterson 2008).

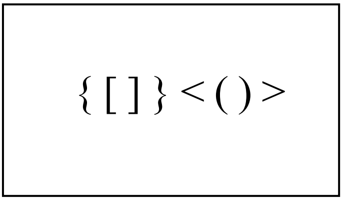

Fig.1-1 Principle of symmetry

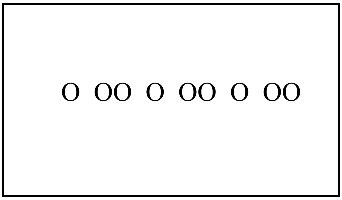

Fig.1-2 Principle of proximity

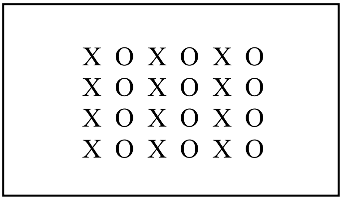

Fig.1-3 Principle of similarity

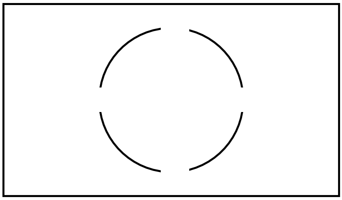

Fig.1-4 Principle of closure

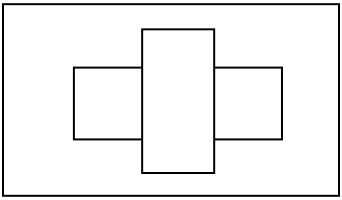

Fig.1-5 Principle of continuity

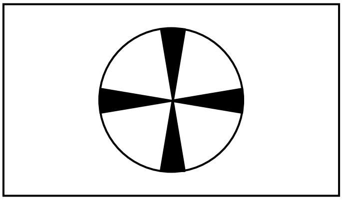

Fig.1-6 Principle of smallness

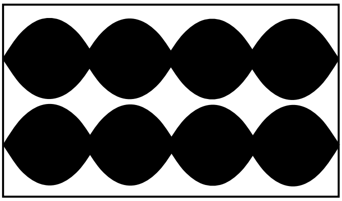

Fig.1-7 Principle of convexity

Once the sensory stimuli have been segregated into figures and grounds, the perceptual system undertakes the task of converting the two-dimensional image into a three dimensional one. The perception of depth, a fundamental component of this process, is crucial in such common tasks as reaching for and manipulating objects, assessing the distance from one car to another while driving, or assessing how loudly to call a friend who is just passing by at some distance. The perception of depth is based on a number of different cues which are generally divided into monocular, derived from the vision of a single eye, and binocular, derived from the combined vision of two eyes (Parkin 2002, Sternberg 2001).

One of the most powerful monocular cues is linear perspective, the phenomenon observed when two parallel lines become farther and father apart as they move away from the horizon or converge as they move closer to it. Objects appear to be more distant from the observer when the lines of perspective are closer to one another and, conversely, they appear more proximal when the lines are farther apart. Interposition and motion parallax also provide an impression of depth. Interposition refers to the assumption that an object obscuring another is nearer the viewer. Motion parallax allows us to perceive closer objects as bigger and moving faster and more distant objects as smaller and more stationary. Other important cues of depth perception involve texture gradients and the contrast between objects and their backgrounds. The impression of depth is achieved when elements of texture become denser as they recede into the distance and sparser when they move closer to the observer. Contrast changes when more distant objects seem to merge with the background, becoming less distinct from it and, conversely, when closer objects appear to be more clearly defined.

Convergence and stereopsis are binocular cues of depth perception related to the fact that the human eyes are distant enough from one another to provide the brain with different types of sensory information. When the viewer observes an approaching object, the eyes converge towards the nose and the movements of the optical muscles are interpreted by the brain as a cue of depth. On the contrary, when the object becomes more and more distant, the optical muscles are relaxed and the eyes are directed more towards the ears. Stereopsis relates to the fact that the both eyes have different views of a given object. When an object is closer to the viewer, there is a considerable difference between the views coming from the right eye and the left eye. However, when the object is farther away from the viewer, there is a minimal divergence between the views coming from both eyes. These visual discrepancies can be used by the brain to compute depth.

At this moment, when figure-ground segregation has been completed and depth assessed, the representation of an object in the mind is still viewer-centred, that is, dependent on the actual view of the object an individual has (Parkin 2002). Fig.1-8 illustrates a jug standing on a table with its handle on the right side of the observer's visual field. This view changes when the jug is turned on its side as its handle is, then, located on the left side of the visual field. Alternatively, when the jug is turned on the other side, the handle remains on the left side of the visual field, however its position changes:

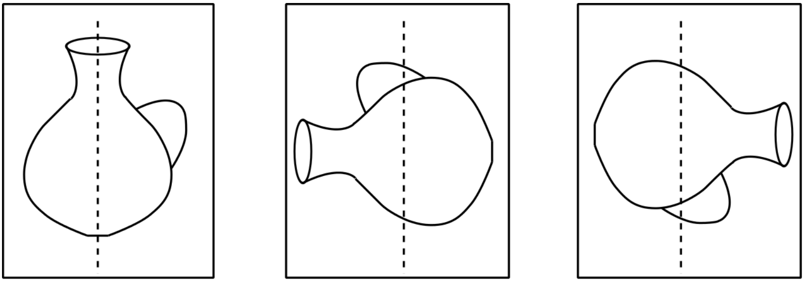

Fig.1-8 The standing jug–the handle is on the right side of the visual field; the jug turned to its side–the handle is on the left side of the visual field (adapted from Parkin 2002)

However, human perception is based on the object-centred description of any given object, which is independent of viewpoint and which allows the object's features to remain constant irrespective of how it is viewed (Parkin 2002, Sternberg 2001). Even though our view of the environment is continually changing as we move around, we remain unaware of this fact and perceive the world around us as invariable. The phenomenon known as size constancy ensures that when an object becomes bigger as we approach it, its size is still perceived as unchanged. In addition, the perception of colour does not change greatly with different illumination allowing us to perecive a tomato as red both in daylight and in artificial light, the tendency known as colour constancy. Shape constancy allows us to perceive an object as having the same shape irrespective of the angle at which it is viewed. Object constancy signals the establishment of a three-dimensional representation of an object based on its structural description, in which the relationships of various parts of the object are already specified.

The perceptual processes briefly outlined above provide sufficient and accurate knowledge about the physical properties of the surrounding objects, such as their position, size, shape and colour. They do not, however, provide information about what the objects are, what their function is and whether we have seen them before or not. During the final stage of perception, identification and recognition, our higher-level mental processes, such as memory, expectation, motivation, personality and experience enable us to add meaning to perceived percepts. For instance, we are well aware that small moving objects in the skies are more likely to be birds or planes than cars or people. Abstract thoughts, prior knowledge, beliefs and values manage the incoming percepts, giving them titles, labels and explanations placing them in an appropriate segment of the intricate structure of our mental world.

1.1.2. Knowledge and imagery

Perception of the surrounding reality constitutes a fundamental building block of human knowledge. Knowledge-based processes of the human mind interpret, assign meaning to and store neutrally coded information coming from the sensory organs. Generally, human knowledge can be devided into two major types: declarative knowledge, that is, "knowledge that", and procedural knowledge, "knowledge how" (Sternberg 2001). Declarative knowledge is mentally represented in the form of words and visual symbols and it constitutes all the information human beings have about the world around them. Procedural knowledge amounts to subsequent steps of actions. It comprises information about, for instance, how to ride a bicycle, how to drive to a particular place, or how to sign one's name. With reference to language, declarative knowledge refers, among other things, to how people understand words and utterances, whereas procedural knowledge guides the motor processes that accompany speech production mechanisms.

Declarative knowledge is much more relevant for the discussion of spatial prepositions than procedural knowledge. Its two different representational formats, mental images and words, are used to record different information since it is much easier to represent concrete objects, such as *a triangle*, by means of mental pictures and abstract ideas, such as *justice*, by means of words.[4] Mental images are analogue representations of real objects comprising their same shape, size, parts and colours. Words, on the other hand, are symbolic representations of physical objects and, unlike mental images, include only scarse information relating to their physical attributes. The comparison of an image of a cat and the content of the word *cat* recorded in a dictionary definition is illustrative as to the difference between mental images and words.[5] When we imagine a cat, we see a small animal of a specific cat-like shape with particular characteristic features such as four legs, a tail, ears, and a certain brownish colour. In contrast, a dictionary definition of the word *cat* reads: "A small animal with soft fur that people often keep as a pet. Cats catch and kill birds and mice" (*Oxford Advanced Learner's Dictionary*

[4] The building blocks of human knowledge also include more complex structures such as concepts, facts, propositions, rules, and memories (Zimbardo and Weber 1997).

[5] Mental images are linked with lexical items referring to concrete objects. Prepositions belong to a group of functional or grammatical words and they do not invoke mental images as such, but they do invoke schematized spatial relations in the form of their proto-scenes (see section 1.3 for a more detailed discussion).

2005). The definition makes reference to information that is not registered in the mental image of the cat, such as its functions and habits, at the same time ignoring some features which constitute the mental image.

Images and words interact in the mind to form intricate complexes of knowledge. In order to account for mental representation of knowledge in the two formats, psychologists proposed the dual coding hypothesis (Paivio 1969) which assumes the existence of two independent coding systems– a non-verbal imagery processing visual information about objects and events, and a verbal system specialized for handling speech and writing. In this view, the smallest units of the two systems, images and logogens, are assumed to be connected by referential links allowing a word to be associated with its relevant image. The dual coding hypothesis explains in a convenient way experimental findings concerning the better learning of concrete rather than abstract words. Concrete words induce both verbal and non-verbal representational codes which facilitates their recall. In contrast, abstract words are usually more poorly remembered as they rely solely on the verbal code to the exclusion of the visual one.

The most fundamental unit of symbolic knowledge is the concept defined in most general terms as the knowledge or idea of an object. Psychological research has resulted in a number of theories explaining the emergence of concepts, among which the most important are the defining attributes theory, feature comparison theory, prototype theory and exemplar theory (Parkin 2002).[6] The defining attributes model assumes that a concept has certain attributes associated with it. For instance, the concept HORSE includes defining attributes, such as "has four legs, hair, a tail, neighs", as well as non-defining attributes, such as "can be ridden, is piebald." The concepts in the mind are organized into a network of superordinate concepts, such as FISH or BIRD, and other subordinate concepts such as CANARY or SALMON.[7] The network is based on the principle of cognitive economy, which states that only those attributes that distinguish a concept from its superordinates are stored in the concept itself (Collins and Quillian 1969).

The defining attributes model was criticized and rejected on the basis of the fact that not all concepts can be characterized in terms of defining attributes. The concept GAME discussed by Wittgenstein is a well-known example of the concept whose members do not share common defining attributes but

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[6] The process of concept formation can be discussed within the framework of both cognitive linguistics and psychology even though both disciplines base on the prototype-theoretical research conducted by Rosch in the 1970s and 1980s (Geeraerts 2010:244). The extended discussion of concepts in linguistic theory is presented in section 1.2.2.1.

[7] Levels of categorization are discussed in more detail in section1.2.2.3.

are rather linked together by the relation of a family resemblance which cannot be pinned down to one specific feature (Pelczar 2000). Feature comparison theory, proposed in response to the criticism of the defining attributes theory, assumes that concepts are represented as a list of defining and characteristic features. All members of a category possess certain defining features, but only some possess characteristic ones. When an object is to enter a category, its features are compared with the defining features of the category, and it is accepted into it if the overlap is sufficient.

The dissatisfaction with the feature comparison model, which was slightly more efficient than the defining attributes model but which did not represent knowledge in a psychologically realistic way, led to the formulation of the prototype theory of knowledge representation.[8] As Parkin (2002:161) puts it: "(…) prototypes can be thought of as a modern expression of Wittgenstein's idea of family resemblance." Accordingly, a prototype is a typical representative of a class which emerges when individual features of other members of this class coalesce into a single representation. Within this model, the individual instances of the class relate to the prototype by means of similarity rather than the by means of an exact match.

Although the prototype model of knowledge representation seems to be very productive in psychology, the exemplar model is an equally frequent alternative (Parkin 2002). In fact, it is assumed that prototypes emerge through successive encounters with different exemplars of a category. Exemplar theory assumes that no prototype is stored in the mind but only individual exemplars of concepts, which stands in opposition to the premises of the prototype model. A considerable advantage of exemplar models is that they preserve the variability of the instances of a concept, for instance, an individual size, shape and colour of an object. Conversely, the formation of a prototype involves an averaging process whereby specific features and the relations among them are lost. However, exemplar models cannot at the moment reasonably account for the storage and organization of the enormous masses of information that exemplars undoubtedly constitute.

The controversy related to the inefficiency of the prototype and exemplar models has been resolved by a proposal of mixed models of categorization both in linguistics and psychology. Bybee (2001:138), for instance, assumes "a modified exemplar model"–"a model somewhere between these two proposals"–for the phonological representations of words. Similarly, developmental psychologists suggest that both children and adults represent knowledge in terms of prototype and exemplar categories (Horst, Oakes and Madole 2005). It has been suggested that, in psychological experiments, adults form a prototype when they first learn items in a category and remem-

[8] Section 1.2.2.3 is devoted to the prototype theory in linguistic research.

ber individual exemplars only after extensive training. This reverses when categories are sparse and difficult; in such cases participants first learn individual items and they form a summary representation with additional exposure.

1.2. Cognitive foundations of language

The preceding section discussed psychological foundations of language which include space and shape perception and different ways of organizing knowledge in the human mind. The information gathered in the process of the perception of reality constitutes the raw material later used in higher cognitive processing. The present section discusses basic constructs introduced by cognitive research into the theory of language. Image schemas constitute a link between perceptual knowledge and the knowledge of a language. Concepts, categories and prototype models organize linguistic knowledge into coherent structures. The notions of the trajector and landmark, referring to the psychological notions of figure and ground respectively, play a significant role in the semantic description of spatial prepositions.

1.2.1. Embodied experience[9]

One of the main commitments of cognitive linguistics is the notion of embodiment which emphasizes the centrality of the human body in human experience. We experience the surrounding reality through our bodies and the nature of this experience depends on the way we are physically built. Lakoff (1987:12) expresses the embodiment commitment as follows: "Conceptual embodiment: The idea that the properties of certain categories are a consequence of the nature of human biological capacities and of the experience of functioning in a physical and social environment. It is contrasted with the idea that concepts exist independent of the bodily nature of any thinking

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[9] Embodiment is a broad term. Rohrer (2001) distinguishes ten perspectives on the notion of embodiment derived from multiple methodologies. The following is just a sample of four. Embodiment 1) can have a phenomenological meaning which refers to the things people notice consciously about the role of human bodies in shaping self-identities and culture; 2) can refer to the cultural contributions in which the body, cognition and language emerge (cultural artifacts); 3) can mean what Lakoff and Johnson (1998) call the cognitive unconscious–in which case it refers to the shaping of conceptual thought by unconscious processes revealed through experimental psychology; 4) can be used in the neurophysiological sense when it refers to the neural structures underlying processes like metaphoric projection or object-centered and viewer-centered frames of reference in the visual system.

beings and independent of their experience." In the same vein, Evans and Green (2007:45) state that "[t]he idea that experience is embodied entails that we have a species-specific view of the world due to the unique nature of our physical bodies. In other words, our construal of reality is likely to be mediated in large measure by the nature of our bodies."

Our experience of gravity is an example of how the human physical constitution affects the nature of human experience (Evans and Green 2007). Although gravity is an objective physical phenomenon, human beings and other species experience it differently due to their biological distinctness and the environments they inhabit. For instance, hummingbirds live in the same ecological niche as human beings, but their specific morphology makes them experience gravity in a different way. Hummingbirds are able to rise from the ground without pushing off it, using only the rapid movement of their wings. They also experience motion differently due to their small size–they experience little momentum and can stop almost instantaneously. Conversely, human beings have to push off the ground using the strength of their muscles, cannot hover over it and have to land soon after they have pushed off. When running, human beings cannot come to a standstill immediately, but they slow down gradually taking a few steps before they stop. Other organisms, fish for instance, experience gravity in yet another way since their physical constitution is different from that of people and since they inhabit a different environment. As water reduces the effects of gravity to a considerable degree, the morphology of fish is adapted to the surrounding conditions, enabling them to move through the water easily.

The effects of gravity influence the geometry of the TR and LM encoded in the A-B-C Trajectory Sense of the preposition *over*. As will be shown later, the A-B-C Trajectory Sense of *over* encodes an archlike trajectory of the TR over the elevated LM. The trajectory takes the shape of an arch only when the TR works against the force of gravity pushing off the ground, moves over an obstacle and lands on the other side of it under the influence of gravity.

1.2.1.1. Image schemas

According to cognitive theory, human embodied experience has a direct influence on human cognition. The reality we perceive and the concepts we form in the process of maturation derive directly from the typically human experience of the world. This embodied experience manifests itself on the cognitive level in the form of image schemas, that is, rudimentary concepts such as CONTACT, CONTAINER, BALANCE, etc., directly linked with human perceptual experience.

Although the notion of image schema is widely accepted in cognitive linguistics, it is difficult to define it in precise terms. It has been agreed that image schemas are “mental patterns associated with broad classes of concepts or experiences” (Grady 2005:36). Originally, Lakoff (1987) and Johnson (1987) emphasized the aspect of the bodily perceptual experience in image schemas: “Image schemas are relatively simple structures that constantly recur in our everyday bodily experience: CONTAINER, PATHS, LINKS, FORCES, BALANCE, and in various orientations and relations: UP-DOWN, FRONT-BACK, PART-WHOLE, CENTRE-PERIPHERY, etc.” (Lakoff 1987:267). Johnson (2005:15) argues that the image schema is a key conception which can help to explain “how (…) meaning, imagination, and reason–the marks of human intelligence–emerge from our organic, bodily interactions with our environment.”[10] However, even the earliest discussions of the notion involved certain image schemas which are not directly tied to sensory experience (Grady 2005). The CYCLE schema, for instance, refers to the general pattern of recurring states and not to any specific type of cycle, such as a circle or circular motion.

Even though image schemas are often referred to as patterns or structures, it should be remembered that the structural aspects are not the total content but merely a “skeleton” of meaning (Johnson 2005:28-29). Aspects such as qualities, values and norms also contribute their part to the meaning and constitute its “flesh and blood.” For instance, we experience the CONTAINER schema when we are held tightly in someone’s arms and when we are constrained in a small room; however, the qualities, values and norms of the experiences are very different. In the same vein, Grady (2005:44) suggests that image schemas should be treated as “fundamental units of sensory experience” or “minimal gestalts–self-contained dimensions of our richer perceptual experience.” Gibbs (2005:115) takes this idea even further suggesting that “image schemas are best understood as experiential gestalts which momentarily emerge from ongoing brain, body and world interactions.” He argues that image schemas, also more static ones such as OBJECT or COMPLEXITY, are continually linked to embodied actions operated by the so-called body schemas responsible for integrating the bodily posture and posi-

[10] Image schemas can be used to explain conceptual metaphors operating in a broad range of mathematical fields. For instance, the COLLECTION image schema is found in the metaphor ARITHMETIC IS OBJECT COLLECTION. The mappings from the source domain (object collection) to the target domain (mathematical addition) involve: collections of objects of the same size– numbers, the size of the collection - the size of numbers, bigger–greater, smaller–less, the smallest collection–the unit (one), putting collections together -addition, taking a smaller collection from a larger collection–and subtraction (Johnson 2005).