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Spatial Semantics

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Chapter 13

Spatial Semantics

Jordan Zlatev

1. Introduction

This chapter presents an overview of cognitive linguistic research in spatial semantics, i.e., investigations into the meaning of spatial language that regard language as an integrated part of human cognition. This rather broad definition is meant to cover not only the type of research that can be said to constitute 'the prototype' within Cognitive Linguistics (e.g., by Lakoff, Langacker, and Talmy) but also research that 'deviates' from this prototype (e.g., by Jackendoff, Levinson, and Sinha).

Within the cognitive linguistic literature so far, there have been three substantial edited volumes (Bloom et al. 1996; Pütz and Dirven 1996; Hampe 2005), two special issues of the journal *Cognitive Linguistics* (1995, issues 3 and 4), a large number of monographs (Brugman 1981; Lindner 1981; Casad 1982; Cuyckens 1991; Vandeloise 1991; Durst-Andersen 1992; Svorou 1994; Regier 1996; Zlatev 1997; Takahashi 2001; Levinson 2003; Tyler and Evans 2003; Pourcel 2005), and numerous articles (e.g., Talmy 1983; Landau and Jackendoff 1993; Sinha and Kuteva 1995; Kreitzer 1997; Cienki 1998; Pederson et al. 1998; Engberg-Pedersen 1999; Sinha and Jensen de López 2000; Tyler and Evans 2001 and Goddard 2002)—all of these dedicated largely to spatial semantics. A natural question is: Why has spatial meaning received such extensive attention?

One reason is universality. Space pertains to a central and universal aspect of human experience, and thus constitutes a good searching ground for linguistic universals, as exemplified in the work of, for instance, Talmy (1975, 1983, 1985, 1988, 2000). Conversely, the demonstration of language-specific patterns of semantic and possibly conceptual categorization in this type of domain would provide a strong case for 'linguistic relativity' (Whorf 1956; Pourcel 2005) or at least 'linguistic mediation' (Vygotsky 1978; Bowerman 1996; Pederson et al. 1998; Levinson 2003).

The second major reason for the focus of Cognitive Linguistics on spatial semantics has to do with the supposed 'basic' nature of SPACE. It has long been known that there are strong parallels between SPACE and other semantic domains, reflected in the fact that the same expressions often take spatial, temporal, and other more abstracts meanings, as seen in expressions such as *from here to there, from now to tomorrow,* and *from me to you* (Gruber 1965; Anderson 1971; Clark 1973). The standard cognitive linguistic explanation of this parallelism is *conceptual metaphor*, i.e., a systematic asymmetric mapping between two experiential domains, where the more abstract domain is understood in terms of the more concrete one (Lakoff and Johnson 1980; Lakoff 1987; this volume, chapter 8). Since SPACE appears to be more concrete than the domains it maps onto, its structure is expected to be mapped onto these domains: "Space is at the heart of all conceptualization" (Putz and Dirven 1996: xi); "Abstract domains are consistently conceptualized in terms of spatial image schemata" (Kreitzer 1997: 317). If that is indeed the case, an understanding of spatial

categorization would provide us with the key to human conceptual categorization in general.

However, the metaphorical interpretation of the space/nonspace analogy is not uncontroversial, other possible explanations being historical processes of grammaticalization (Heine, Claudi, and Hünnemeyer 1991) or fundamental properties of mental representation rendering SPACE and other domains partially isomorphic (Langacker 1987; Jackendoff 1990). In both cases, it would be possible to argue that SPACE is *not* experientially more basic than, e.g., TIME (Engberg-Pedersen 1999; Evans 2003). At the same time, this controversy has itself sparked research into the supposed primacy of SPACE (see section 5.4).

The overall structure of this chapter is as follows. Section 2 sets the stage by addressing two important preliminary questions, each of which allows for several answers: *What* is to be regarded as 'spatial language'? and *How* can spatial semantics be studied from the nonmodular, interdisciplinary perspective of Cognitive Linguistics? Despite substantial differences between the various approaches to spatial semantics, one can discern a basic set of spatial semantic concepts within the literature, which are presented and discussed in section 3. Section 4 provides a brief review of the empirical basis for such generalizations, showing an initial focus on European languages, but a gradual movement toward non-Indo-European languages and eventually more general typological frameworks. Section 5 takes up four controversies, often discussed in connection with spatial semantics, but of more general significance for linguistic theory, and reviewing these should give us an idea of the 'problem space' that an explanatorily adequate theory of spatial meaning would need to negotiate. The chapter concludes with a summary and some anticipations for further research in spatial semantics.

2. Spatial semantics: What and How?

2.1 What: The Scope of Spatial Semantics

Spatial semantics is the study of the meaning of spatial language, but what is to be regarded as 'spatial language'? A moment's reflection suffices to show that the answer to this question is anything but trivial, since SPACE is not a self-contained 'semantic field', but rather constitutes an important part of the background for all conceptualization and meaning (Kant [1787] 1964). Furthermore, the term 'space' has been used all too often in an extended, metaphorical sense in Cognitive Linguistics and Cognitive Science, e.g., 'Space Grammar' (Langacker 1982), 'Mental Spaces' (Fauconnier 1985), 'Conceptual Spaces' (Gärdenfors 2000). Hence, an unrestricted interpretation of the term 'space' might lead us to think that 'all semantics is spatial semantics', a conclusion that not even cognitive linguists would find too attractive. Therefore, the scope of spatial semantics needs to be restricted, and this can and has been done in at least three different ways: by form class, by semantic category, and by communicative function. The three definitions based on these restrictions do not coincide, however, and each leaves something to be desired.

Perhaps the most common way of defining the scope of spatial semantics is in terms of a class of expressions, i.e., a 'form class', that specializes for spatial meaning: e.g., 'spatial prepositions' (Cuyckens 1991; Landau and Jackendoff 1993), 'closed-class forms' (Talmy 1983), or 'spatial grams' (Svorou 1994). As Svorou has it, "To talk about space and spatial relations … languages make use of a relatively small number of elements… I will refer to all these grammatical forms of language which express primarily spatial relations as *spatial grams*" (Svorou 1994: 31). However, this way of defining spatial meaning is problematic since it lacks the appropriate means to distinguish spatial from nonspatial senses of expressions and it aprioristically limits the domain of analysis to a class which is by no

means universal (Brown 1994). Even if the class is broadened in the manner suggested by Talmy and Svorou, the definition still misses the contribution of spatial verbs, nouns and adverbs (see section 5.2).

An alternative is to define spatial language *notionally*, e.g., spatial are those expressions which express 'spatial relations' (Lakoff 1987; Sinha and Thorsheng 1995; Regier 1996; Kreitzer 1997). This semantic category assumes the semantic primitives trajector (or 'Figure') and landmark (or 'Ground'), whereby the location or motion of the first is characterized in terms of its relationship to the second (see section 3.1 and 3.2). Again, however, this definition is not general enough because different languages may employ different strategies of locating objects in space, and not all strategies are equally relational (Levinson 1991, 1994; Kreitzer 1997). In English, we can readily characterize the meaning of (1a) in terms of a trajector–landmark relation and this can also be extended to (1b), where the landmark expression can be said to be 'elliptic' and the landmark implicit. But to offer a similar analysis for (1c) and (1d), we would need to postulate landmarks of a different sort, possibly the sky in (1c) and the speaker in (1d).

(1) a. The balloon passed over the house.
b. The balloon passed over.
c. The balloon went up.
d. The balloon went over there.

However, treating (1a–b) on a par with (1c–d) would miss an important distinction: (1a) not only represents a landmark through the noun phrase *the house*, but without it there is no way to determine the spatial coordinates of the trajector. Similarly for (1b): even though the landmark is left implicit, it is still conceptually necessary to charaterize the trajector's motion in space. In contrast, (1c) and (1d) not only lack an explicit landmark, as does (1b), but they *do not need* one conceptually since the trajector's position is determined not through object-like reference points, but through coordinate systems (see section 3.3). A possibility would be to exclude sentences such as (1c) and (1d) from the subject matter of spatial semantics proper. This would, however, be both arbitrary and ethnocentric, considering the basically relational meaning of Indo-European adpositions.

A third way of defining spatial semantics is through *communicative function*: spatial semantics pertains to the meaning of utterances that help the addressee determine the location or trajectory of motion of a given referent in discourse (Zlatev 1997; Pederson et al. 1998; Levinson 2003). An operational definition of a spatial utterance would be one which answers a question beginning with *Where* (or is such a question). This definition intuitively excludes (metaphorical) extensions such as (2), but includes the examples (1c) and (1d). This approach would be objected to by those who wish to assign spatial semantics to literal, nonspatial uses (e.g., Lakoff 1987), but it does provide a principled basis for constraining the domain of study. It may even offer a clue as to *which* extended uses can cognitively be treated as spatial: those such as in (3b), which occur in utterances that can be given as answers to *metaphorical Where*-questions (in those languages that permit such questions).

(2) He is over his divorce.
(3) a. Were is he now in his career?
b. He is pretty much on the top.

However, in order to exclude from the domain of spatial semantics utterances which fulfill the locative communicative function via 'conversational implicatures' (Grice 1975) (e.g., the answer *He is washing the dishes* to the question *Where is he?,* which can conversationally be

inferred to mean *He is in the kitchen*), we can add the requirement that spatial utterances must express the locative function *conventionally*, similar to Grice's distinctions between conversational and conventional implicatures. Thus, we can define the object of study of spatial semantics as being (above all) *spatial expressions, i.e. conventional specifications of the location or change of location (i.e. translocation) of an entity in space*.

2.2 How: Methodologies for Investigating Spatial Semantics

There has been considerable debate within Cognitive Linguistics concerning the proper methodology for studying language and meaning 'cognitively': Sandra and Rice (1995), Cuyckens, Sandra, and Rice (1997), and especially Sandra (1998) have expressed strong skepticism about the use of linguistic intuitions and the analyses based on them and advocate psycholinguistic experimentation. Tuggy (1998) counters that analyses based on 'intersubjectively valid intuitions' can indeed provide evidence for mental representations. Geeraerts (1999) presents the controversy in the form of a Socratic dialogue between an 'idealist' and an 'empiricist'.

This methodological debate could possibly be resolved —as suggested by Popper (1962) and Itkonen (1983, 1997)—by accepting that language exists (at least) at three different ontological levels, each with its type of data and appropriate methodology. I will therefore briefly describe an Itkonen-inspired division of linguistic levels and relate each to corresponding studies of spatial semantics. The point is to show that there is room for ontological and methodological pluralism in the study of (spatial) meaning, while at the same time one must be aware of the limits of one's particular level and seek cross-level correspondences.[1]

The (Nonobservable) Normative Level: Language as Shared Conventions. It can be argued that ever since the time of Pânini, linguistics has always been 'cognitive' in the sense that its main method has consisted in describing, in as general a way as possible, one's *intuitions* and those of informants about grammaticality and meaning. Itkonen's crucial point is that these intuitions reflect *normative* knowledge: not knowledge about how one does in fact speak, or even less about what goes on in one's head when one speaks, but intuitions about how one *should* speak. Since it is impossible to have such normative knowledge privately (Wittgenstein 1953), this level of knowledge and meaning is primarily *social*. In this sense, whether they are aware of it or not, when linguists describe linguistic structures, they describe the human mind, rather than 'linguistic behavior', 'a mental organ', or some platonic realm. However, it is not the private mind of individual speakers, but the 'common mind' (Pettit 1996) and the 'mediated mind' (Nelson 1996) which are shared by conscious beings tapping into essentially the same set of linguistic norms or conventions, thereby avoiding the subjectivity of 'idealism' pointed out by Geeraerts (1999).

The traditional and most direct way to study this level is by *explication* of these shared norms, which exist as nontheoretical knowledge, in terms of theoretical knowledge, following standard theoretical criteria such as simplicity, generality, and internal consistency. Another criterion is intuitiveness, because speakers have at least a degree of conscious access to their nontheoretical semantic knowledge (Zlatev in press). Furthermore, this level can also be studied more indirectly, by analyzing actual performance, asuming that the underlying nonobservable knowledge guides the behavior of speakers.

It appears that so far Cognitive Linguistics has, to a large extent, failed to realize the nature and importance of the (nonobservable) normative level. This is reflected by the disparaging comments toward it from advocates of experimentation: "purely aesthetic, that is, wholly theoretical grounds (e.g. by appeals to descriptive economy, naturalness, generality,

and explanatory power), and it is that theoretic aesthetic that cognitive linguists have explicitly rejected from the beginning" (Cuyckens, Sandra, and Rice 1997: 51), as well as those who defend the use of linguistic intuitions: "[unless] what you posit has anything to do with what is going on in peoples' heads, and go play hocus-pocus games with theoretical entities that correspond to nothing mentally real" (Tuggy 1999: 364). Since normative knowledge is by definition *conceptual*, it is by standard philosophical definitions neither (individual-) psychological nor empirical. It does not, however, thereby become 'noncognitive', nor its description 'purely aesthetic', and 'hocus-pocus'.

Returning to spatial semantics from this methodological digression, it becomes immediately obvious that well-known analyses such as Talmy's (1983), Jackendoff's (1983), and Lakoff's (1987), while relying on different theoretical concepts, are nothing else but explications of the authors' intuitions. A classic in the literature, the (everlasting) 'Story of *Over*' (Brugman 1981), can illustrate how a cognitive semantic analysis can be criticized and improved based on the criteria downplayed in the above quotations. Lakoff (1987: 416–461) made the preposition *over* famous by reformulating Brugman's analysis into an elaborate 'radial category' representation of twenty-four interrelated senses. However, his analysis was criticized by Vandeloise (1990) for lacking simplicity and rigor, while Vandeloise himself was attacked for failing to explain generalizations to nonspatial domains and for using "false intuitions" (Kreizer 1997). Dewell's (1994) analysis can be said to win in terms of simplicity by positing a single central sense, and deriving the others from it, but has on its part been criticized for using nonintuitive 'image schema transformations' which have been argued to fail to generalize to other prepositions and languages (Keitzer 1997). Finally, Tyler and Evans (2001) criticize most of the previous analyses for lacking a systematic methodology to distinguish 'senses' from 'contextual interpretations' as well as deciding which sense is to be regarded as prototypical. Characteristically, the methodology they propose is based on intersubjectivity (cf. section 5.4 below).[2]

The Observable Social Level: Language as Behavior. Language can, of couse, be analyzed not only on the normative level (i.e., how we think we should speak), but also as actual behavior (i.e., how we actually speak or otherwise produce language). This actual 'performance' constitutes the primary data of corpus linguists, conversation analysts, and sociolinguists. Language in this sense is still social, i.e., a matter of communication, but it is not *directly* normative. Nevertheless, the two levels remain interdependent. If the 'nonobservable' normative level corresponds to Saussure's *langue,* the observable social one corresponds to *parole*; and as is the case with *langue* and *parole*, the relationship between the two is dynamic: the normative level provides the system that makes language use possible, but as the latter is in constant flux, it changes the system with time. Corpus analysis is the standard method for studying language use, and it is an invaluable complement to linguistic intuitions because it can uncover patterns and regularities, especially of a quantitative nature, which are not directly accessible to consciousness. It can also be used to corroborate or question the adequacy of particular linguistic analyses based on intuitions.

Spatial semantics has in this respect profited immensely from the cross-linguistic *Frog Story Corpus* (Berman and Slobin 1994; Strömqvist and Verhoeven 2003). For example, on the basis of Talmy's (1991, 2000) well-known typological distinction between 'verb-framed' and 'satellite-framed' languages, Slobin (1997) has compared the narratives of English- and Spanish-speaking children and adults and found that English and Spanish speakers systematically express motion events differently, in accordance with the two type a speaker's language belongs to. Another example of how naturalistic discourse has facilitated uncovering cross-linguistic differences is provided by Pederson et al. (1998) in their investigations of the use of different 'frames of reference' (see section 3.3). The authors'

methodological credo is that "it is not enough to rely on descriptions of languages that are based on conventional elicitation techniques as these may not fully reflect actual socially anchored conventions" (Pederson et al. 1998: 557).

The Individual-Psychological Level: Language as Mental Representation. While Sandra (1998) is arguably misguided in claiming that linguistic analyses (and corpus studies) cannot help to elucidate the conceptual level of meaning, he is certainly right in claiming that without empirical, psycholinguistic studies, nothing particular can be said about the individual mental level of language. How, then, has this level been elucidated with respect to spatial semantics?

a. *First language acquisition and developmental studies*. By studying the order and manner in which different spatial expressions and different senses of the same expressions are acquired by children, inferences can be made about which expressions/senses are more psychologically 'basic' and about the nature of semantic primitives (Choi and Bowerman 1991; Bowerman 1996; Rice 1999; Zlatev 2003a).
b. *Second language acquisition studies*. By studying the way second language learners master the structures of their L2, and the mistakes they make, inferences can be drawn about the nature of their L1 categories (Frisson et al. 1996; Rice, Sandra, and Vanrespaille 1999).
c. *Off-line psycholinguistic experiments*. In a number of experiments, subjects are given stimuli sentences with different senses of the same preposition, andey are asked to reflect on and rate in terms of perceived similarity or to sort into classes. On the basis of these experiments, conclusions can be drawn concerning the perceived relatedness between, e.g., spatial and nonspatial senses of prepositions (cf. Sandra and Rice 1995; Rice, Sandra, and Vanrespaille 1999).
d. *On-line psycholinguistic experiments*. Experiments in which subjects are asked to generate sentences under time constraint (Rice, Sandra, and Vanrespaille 1999) or to perform a primed lexical decision (Sandra and Rice 1995) have attested a dominant spatial sense for the prepositions *at*, *on*, and *in*, but separate mental representations for the temporal senses.[3]
e. *Naming and description experiments*. Experiments involving a design in which the speakers' mental representation is inferred by eliciting a spatial description while varying the parameters of the described situation (e.g., Carlson-Radvansky and Irwin 1993; Levelt 1996) have shown that e.g. the Geocentric 'frame of reference' (FoR) dominates over the Object-centered and the Viewpoint-centered frames (cf. section 3.3) in the semantics of the preposition *above*.
f. *Linguistic relativity experiments*. To determine if spatial semantic categories are used in thought and not just in language, it is necessary first to demonstrate that there are differences in the linguistic conceptualization of space, then to perform an experiment involving nonlinguistic cognition and to determine if there is a *correlation* between the linguistic structure and the behavior of the speaker. Finally, alternative explanations for the correlation need to be excluded, and the direction of the causality decided. This is a difficult procedure, but it has been carried out extremely carefully by the Language and Cognition Group at the Max Plank Institute of Psycholinguistics in Nijmegen, showing that the dominant linguistic 'frame of reference' (see section 3.3) does indeed appear to affect speakers' performance on various nonlinguistic spatial tasks (Levinson 1996, 2003; Pederson 1995; Pederson et al. 1998). Pourcel (2005) presents a good survey of

the field and demonstrates a degree of linguistic relativity with the domain of 'motion events'.

The Neural Level: Language in the Brain. There is one more possible level at which (spatial) meaning may be studied—the neural level; at this level, spatial meaning is not studied in terms of norms, behavior, or mental representation, but in terms of the neural structures supporting it. While there is much work in cognitive neuroscience on space perception and cognition, there is little that investigates spatial semantics explicitly. Landau and Jackendoff (1993) attempted to relate prepositions to the 'where system' in the brain, and nouns to the 'what system', but this was done without enough corroborating evidence; further, since spatial meaning is not expressed exclusively by prepositions, this proposal appears to be unsubstantiated. Another early hypothesis relating space, language, and the brain was Deane's (1994) 'Parietal Hypothesis', according to which spatial 'image schemas' in the inferior parietal cortex may govern syntactic processing in general; the evidence for this hypothesis has, however, been called into doubt (Kemmerer 1998). More extensive attempts have been made to relate frames of reference to underlying neural analogues (Petersen et al. 1996), but these proposals, too, are not without difficulties since cognitive and linguistic reference frames are *not* the same (see section 3.3). Finally, one must mention the stimulating but preliminary attempts to explain (spatial) meaning in neural terms within the Neural Theory of Language (e.g., Feldman and Narayanan 2004; Dodge and Lakoff 2005).

In sum, one could say that despite mutual rapprochement (Rohrer 2001), Cognitive Linguistics and neuroscience have not yet converged on a joint program for dealing with language in general and spatial language in particular. However, this is likely to change in the near future. Given the potential of modern brain-imaging techniques, it should not be impossible to design an experiment in which, for instance, the neural activity of speakers of typologically different languages could be compared during performance of an identical nonlinguistic spatial task.

Computational Modeling: Which Level? It may be tempting to interpret computational models of spatial semantics such as Regier's (1996) as models of the neural level of organization, and indeed that is exactly how they are interpreted by Lakoff and Johnson (1999) and within the Neural Theory of Language. Regier's connectionist model is, however, only loosely inspired by neurobiology and includes elements that derive from intuition-based linguistic analysis such as Source, Path, and Goal representations. Instead, Zlatev (1997, 1999, 2003c) uses Regier's original model and extension of it in order to test a hypothesis concerning the *psychological* level of spatial meaning, namely that mapping situations to whole utterances, rather than to single lexical items, improves learnability and furthermore helps to explain (the mental representation of) spatial polysemy. Finally, computational modeling may also be interpreted as a form of explication, a theoretical re-description, of the normative level of shared conventions, as suggested by Itkonen and Haukioja (1996) for linguistic analogy, and by Zlatev (2000) for the ability to generalize familiar spatial descriptions to novel situations.

3. Basic Spatial Semantic Concepts

A multitude of spatial categories have been proposed as 'universals' or 'primitives' in the literature, and providing a characterization for all of them would be prohibitive. However, the following seven spatial concepts are present in almost all descriptions of spatial semantics. And while authors may not agree on the terms and definitions or make different distinctions,

given the large theoretical variation, the bare fact that there seems to be agreement on the essential nature of these concepts is significant. The important issue concerning their ontological status is deferred to section 5.1.

3.1 Trajector

A spatial utterance must express or profile a 'trajector', i.e., the entity whose (trans)location is of relevance (Lakoff 1987; Langacker 1987; Sinha and Thorsheng 1995; Regier 1996; Zlatev 1997). The trajector may be static (4a) or dynamic (4b); a person or an object (4c). It can also be a whole event as in (4d), at least for those analyses that allow relational predicates to take proposition-size structures as arguments (e.g., Langacker 1987).

(4) a. *She* is at school.
b. *She* went to school.
c. *The book* is on the table.
d. *She is playing* in her room.

Other terms used for this concept are the Gestalt-psychological notion 'Figure' (Talmy 1975, 1983, 2000; Levinson 1996, 2003) and the more general term 'referent' (Miller and Johnson-Laird 1976; Levelt 1996)—though these usually apply to object-like entities and not to events as in (4d).

3.2 Landmark

The 'landmark' is the reference entity in relation to which the location or the trajectory of motion of the trajector is specified. Other terms include: 'Ground' (Talmy 1975, 1983, 2000; Levinson 1996, 2003) and 'relatum' (Miller and Johnson-Laird 1976; Levelt 1996). Views differ, however, on whether a landmark/Ground/relatum is *always* involved in a spatial predication, as was discussed in connection with the 'problematic' examples (1b) and (1c) in section 2.1. For example, is there a landmark in the commonly used utterance (5) and, if so, what is it?

(5) Come here!

One answer is provided by Langacker, who initiated the systematic use of the terms trajector and landmark as referring to extremely general notions which are not confined to (and need not be projections from) the spatial domain: "The trajector/landmark asymmetry is fundamental to relational predicates and underlies the universal subject/object distinction" (Langacker 1987: 231). Hence, it is not surprising that in his analyses any kind of 'point of reference' can serve as a landmark. Most authors (e.g. Jackendoff 1990; Sinha and Thorsheng 1995; Levinson 1996) would, however, not treat the deictic center of such utterances as a landmark, and as pointed out in section 2.1, with good reasons.

3.3 Frame of Reference and Viewpoint

A spatial concept which has received considerable attention lately is that of a linguistic 'frame of reference' (FoR). However, while almost all authors acknowledge its importance, no two authors define it the same way. In the most general sense, a FoR defines one or more 'reference points', and possibly also a coordinate system of 'axes' and 'angles'. Depending on the types of the reference points and coordinates, different types of FoR can be defined. A

strong claim is that as far as language is concerned, "there are exactly three frames grammaticalized or lexicalized in language" (Levinson 1996: 138):

a. *Intrinsic FoR*: the main reference point coincides with the landmark, and axes and angles are projected on the basis of its geometry;
b. *Relative FoR*: a real or imaginary viewpoint serves as a reference point and coordinates are projected on the basis of this viewpoint;
c. *Absolute FoR*: the system is anchored in fixed geo-cardinal positions.

Spatial expressions defined on the basis of these frames have different logical properties: intrinsic and absolute relators are binary, while the relative one is ternary. The relative and the absolute frames support transitive and converse inferences, while the intrinsic frame does not.

Instead of 'frame of reference', Levelt (1996) uses the term 'perspective system', and makes a similar three-part distinction; however, he refers to the relative system as 'deictic', which, without any further qualifications, is inadequate. Jackendoff (1996) distinguishes between four 'intrinsic' and four 'environmental' frames, but this classification is based solely on the author's own intuitions (for English) rather than on cross-linguistic generalizations, and appears somewhat ad hoc. For Langacker (1987), as mentioned above, every kind of reference point is a landmark (where some may be more profiled than others); according to this model, the reference point(s) and other geometric notions constitute the 'abstract domain' for the definition of a spatial expression. Thus, the notion of FoR is subsumed under that of 'domain' in Cognitive Grammar. This approach is certainly general, but it does not capture what is specific about the concept 'frame of reference': e.g., that there appear to be only three types of FoRs in all human languages.

However, a limitation of Levinson's three-way division is that it only applies to the static projective relations on the horizontal plane. So a claim to the effect that there are languages which do not use the absolute frame would relate to the horizontal plain only, and does not exclude that the absolute frame may be used for terms which refer to the vertical dimension. In earlier work (Zlatev 1997), I have made an attempt to generalize Levinson's three-way division using the terms 'allocentric', 'deictic', and 'geocentric' frames of reference, respectively. However, this analysis is problematic since it confounds type of FoR with landmark type, while Levinson (1996) correctly insists that "linguistic frames of reference cannot be defined with respect to the origin of the co-ordinate system" (1996: 135). For example, (6a) and (6b) employ a relative frame despite different kinds of origins, while (7a) and (7b) use the different frames relative and intrinsic, despite the fact that in both cases the 'origin' (O) of the frame is the speaker.

(6) a. He is in front of the bush. (FoR: Relative, O: Speaker)
b. He is in front of the bush from John's point of view. (FoR: Relative, O: John)
(7) a. Sit behind the bush. (FoR: Relative, O: Speaker)
b. Sit behind me. (FoR: Intrisic, O: Speaker)

A generalization seems nevertheless to be possible: a *Viewpoint-centered* frame, as in (6a), (6b) and (7a), *need* not have the speaker (or the addressee) as origin, and thus need not be properly speaking 'deictic'. At the same time, deictic examples such as (1d) and (5) can be subsumed under this notion, with the proviso that they (i) do not involve any angles and coordinates but only a reference point and (ii) are dyadic rather than triadic. Thus, they are conceptually much simpler and, not surprisingly, are acquired earlier by children. What is common to both (dyadic and triadic) types is that the location or motion of the trajector need

not be defined in relation to an explicit landmark, as it is, for instance, in (7b), but is defined in relation to a viewpoint. The *Object-centered* frame, by contrast, always involves a landmark, and can be either projective (i.e., 'intrinsic'), as in (7b), or nonprojective (topological), as in examples (4a-d). Finally, the *Geocentric* frame involves both the horizontal and the vertical plane, and as the other two frames, can be generalized to both static (8a) and dynamic (8b) descriptions:

(8) a. The picture is above the TV. FoR: GEOCENTRIC
b. Go west! FoR: GEOCENTRIC
c. Go toward the setting sun! FoR: OBJECT-CENTERED

The Geocentric frame locates the trajectory through the fixed geo-cardinal positions. As such, it differs from the Viewpoint-centered (e.g., (5), (6)) or the Object-centered frame (e.g., (7b), (8c)), in that it does not rely on a viewpoint or on a landmark object respectively.

This analysis captures Levinson's generalization that there are exactly three linguistic frames of reference and that some linguistic forms 'specialize' for frame, while others may be ambiguous, and still others may 'conflate' two frames. However, it differs in predicting that all languages use all three frames, though for different expressions, and to different degrees in discourse. One utterance may express all three FoRs, as in (9) which displays the power and flexibility of semantic compositionality.

(9)	He	came	up	to	the second floor.
		VIEWPOINT-C	GEOCENTRIC	OBJECT-C	

3.4 Region

Even with an Object-centered FoR and a (true) landmark, languages do not relate the trajector and landmark directly, but through a 'region' that can be defined as a configuration of space in relation to that landmark (Svorou 1994; Zlatev 1997). Quite recently, Talmy (2000) has used the term 'conformation' for essentially the same notion. Jackendoff (1983, 1990) captures the distinction between landmark and region with the terms 'thing' and 'place', two of his semantic primitives, stating that e.g., spatial prepositions such as *in* express place-functions: [PLACE] → [IN ([THING])]. Figure 13.1 shows the regions lexicalized by a number of Japanese locative nouns, which apart from region also specify one (or more) frame(s) of reference (FoR).

[INSERT FIGURE 13.1 ABOUT HERE]

Figure 13.1. Japanese locative nouns expressing the spatial semantic category *region*

Jackendoff holds that the set of such regions or place-functions is universal, but this is doubtful. Rather, all languages appear to make use of the concept, but they can differ substantially both as to the extension of the regions which they express and as to whether they use primarily functional ('force-dynamic') or primarily perceptual ('geometric') properties of the landmark in order to define the region (Levinson 1994). If such variation is granted, then arguments against the universal applicability of the concept 'region' (cf. Bowerman 1996) can instead be interpreted as a characterization of its possible variation. For example, in Korean LOOSE FIT and TIGHT FIT designate basic regions, while in European languages they do not. Most, if not all, of the regions that are relevenat for spatial semantics correpsond to various types of 'image schemas' such as CONTAINMENT and SUPPORT that have been proposed in the literature (e.g. Johnson 1987, Mandler 1996). However, despite its

pivotal role within Cognitive Linguistics, the concept of 'image schema' remains a controvertial and ambiguous notion (Hampe 2005).

3.5 Path

The concept of 'path' is used in cognitive semantic analyses in two very different ways. In its first and more common usage, which may be called 'rich path', it refers to the trajectory of actual or imagined motion of the 'trajector' with respect to the 'landmark' (Talmy 1983; Lakoff 1987). This trajectory may be schematic, but it has both extension and shape. For example, in Dewell's (1994) analysis of *over*, the basic sense of the preposition profiles, in essence, a circular type of path.

The alternative usage of 'path' is based on the cross-linguistic generalization that languages systematically distinguish between (at least) three components of a motion event: its beginning, middle, and end; this usage may be called the 'minimal path' characterization (Jackendoff 1990; Zlatev 1997). On this view, 'rich paths', or trajectories, are derived compositionally by combining the minimal path information (e.g., END) with the region/place information (e.g., INTERIOR) to derive the meaning of a preposition such as *into*. English (and other Indo-European languages) contain many words, mostly prepositions, which *conflate* the concepts 'region' and 'path', but from a broader perspective many if not most languages separate the two categories consistently (Heine, Claudi, and Hünnemeyer 1991; Zlatev 1997). Talmy (2000) has recently arrived at the same conclusion, and therefore currently distinguishes between the 'conformation', corresponding to region as mentioned in section 3.4, and the 'vector' which "comprises the three basic types of arrival, traversal and departure that a Figural schema can execute with respect to the Ground schema" (Talmy 2000: 53).

Even for English, separating 'region' ('conformation') and 'path' ('vector') allows certain generalizations; for instance, the sentences in (10) have the same value for the category 'region', but different ones for 'path'. Including ZERO (no extension) as a possible value of 'path' is consistent with the structure of locative case systems in, for instance, Slavonic and Finno-Ugric languages.

(10)	a. John went out of the room.	Region: INTERIOR	Path: BEGINNING
	b. John went through the room.	Region: INTERIOR	Path: MIDDLE
	d. John went into the room.	Region: INTERIOR	Path: END
	c. John is in the room.	Region: INTERIOR	Path: ZERO

3.6 Direction

If 'path' is defined minimally, then it always requires the category 'region' in order to profile the trajectory, and 'region' always requires a landmark. But as it was suggested in section 3.3, not all reference points are of the same kind and they should therefore not be lumped under the cover term 'landmark' (or 'ground'). How, then, is the translocation of trajector defined in the Geocentric and Viewpoint-centered frames, in the cases where there are no landmarks, as in (5) and (8a)? This can be done through the concept of 'direction', which is specified as a vector along one of the axes provided by a frame of reference. Consider (11):

(11)	a. The plane is flying that way.	FoR: VIEWPOINT-CENTERED
	b. The plane is flying north.	FoR: GEOCENTRIC
	c. The plane is flying towards the North pole.	FoR: OBJECT-CENTERED

In most cognitive semantic analyses, particularly in those where 'path' is treated in the rich

sense (see above), the concept of direction is subsumed under the category 'path' and often referred to as 'imperfective path' (12a) as opposed to the 'perfective path' of sentence (12b), (Hawkins 1984).

(12) a. The bird flew toward its nest.
b. The bird flew to its nest.

It is clear that at least some languages, such as English, treat the two kinds of translocative events expressed in (12) similarly, so that subsuming 'direction' under 'path' is not unmotivated. However, separating 'path' from 'direction' is motivated by other factors. For instance, when 'satellite-framed' languages such as English and German (cf. Talmy 2000: section 4.1)—which typically do not conflate path information into their motion verbs—nevertheless seem to do so (e.g., *sink, fall, rise*), it can be argued that it is *not* 'path' properly speaking, but rather 'direction' that they conflate with motion (Zlatev 2003b).

3.7 Motion

Somewhat similar to the case with 'path', there is a 'rich' and a 'minimal' way of characterizing the concept 'motion' in spatial semantics. Under the rich concept of motion would be subsumed uncontroverstial motion expressions like (11) and (12) – but also examples of 'virtual motion' (Talmy 1983), 'abstract motion' Langacker (1987), or 'fictive motion' (Talmy 1996; Takahashi 2001), such as those in (13).

(13) a. The scenery rushed past us. ('frame-relative motion')
b. I looked toward the valley. ('sensory path')
c. The road goes through the woods. ('coverage path')
d. The church faces toward the square. ('emanation path')
e. The beam leans away from the wall. ('advent path')
f. His office is through the corridor. ('access path')

The term following each example is from Talmy (1996), who presents an elaborate classification of types of 'fictive motion' claiming that motion exists at different levels of "palpability" and that "every speaker experiences a sense of motion for some fictive motion constructions" (Talmy 1996: 215). However, the classification is based very much on the author's introspection, rather than on linguistic evidence and (shared) intuitions (see section 2.2) and appears as somewhat ad hoc. In this respect, it is telling that Takahashi (2001), who applies Talmy's classification to Thai data, arrives at a rather different way of classifying fictive motion expressions.

On the other hand, on the 'minimal' charaterization, motion is treated as a binary category: either there is *perceived* motion or there is not. Apart from the clear examples (11) and (12), there is also perceived motion in (13a). On the other hand, examples (13b)–(13f) would be analyzed from this perspective as stative (Motion: NIL), but with non-ZERO values for 'path'. This is made possible by that fact that the minimal accout of the category 'motion' allows it to be *seperated* from the categories 'path' and 'direction', while the rich one conflates it with these. Thus on the minimal account, (13e) would have the value BEGINNING, (13c) and (13f) would have the value MIDDLE, while (13b) and (13d) would have the value END.

4. Linguistic Description and Cross-Linguistic Generalizations

How have the theoretical concepts described above been applied to linguistic descriptions? The answer to the question is crucial for evaluating the cognitive semantic approach to spatial meaning, since it can be argued that any linguistic analysis, cognitive or not, will be judged first and foremost by its *descriptive adequacy*, not only with respect to particular languages, but also as a basis for cross-linguistic generalizations. Since it is impossible to provide a comprehensive overview of spatial semantic descriptive work here, this section only offers a schematic account of the relevant research during the past three decades.

1970 - 1980. Theoretical and descriptive work of Miller and Johnson-Laird (1976) and Clark (1973) is seldom acknowledged within Cognitive Linguistics, but with their focus on the relation between language and perception, with space serving as a privileged domain, these studies can properly be regarded as some of the predecessors of cognitive linguistic research. Interestingly, this research also displayed a familiar problematic feature: a tendency to make universalistic statements on the basis of few languages, and above all English. Talmy's (1975) classic analysis is also typical in this respect.

1980 - 1990. Seminal work in spatial semantics still largely focused on English prepositions and particles: Brugman (1981), Lindner (1981), Talmy (1983), Hawkins (1984), Herskovits (1986), Lakoff (1987), Taylor (1988). The spatial semantic systems of some typologically quite different languages were also analysed (e.g. Casad 1982; Brugman 1983) but the analyses highlighted rather 'exotic' properties such as body part terms in Mixtec and visible accessibility in Cora, and did not attempt to put these in a typological perspective. One exception is Talmy's (1985) well-known typology of 'lexicalization patterns' based on whether the motion verbs of a language predominantly express:

- Manner/cause of motion, as in Germanic languages (e.g., *walk*, *crawl*, *roll*), while 'path' is expressed in a verb-particle or prefix, a *satellite*;
- Path and direction, as in Romance languages (e.g., Spanish *salir* 'go out,' *entrar* 'go in'), while 'manner' is typically expressed through an adverb;
- Figure (trajector) related information, as in Atsugewi (e.g., *-lup-* 'a small shiny spherical object moving').

1990 - present. The kind of spatial semantic analyses developed earlier were extended with modifications to other European languages: e.g., Dutch (Cuyckens 1991; Geeraerts 1992), French (Vandeloise 1991), and German (Bellavia 1996). Simultaneously, for the first time more serious attention was devoted to the spatial systems of non-Indo-European languages: e.g., Tzeltal (Levinson 1991, 1994; Brown 1994), Cora (Casad 1993), Ewe (Ameka 1995), Zulu (Taylor 1996), Thai (Zlatev 2003b), and a whole volume on Austronesian and Papuan languages (Senft 1997). This decade also saw the *second* Talmyan typology (Talmy 1991, 2000) based on whether 'path', or more generally what Talmy calls the 'core schema' providing the basic semantic structure for a motion event, is predominantly lexicalized by the verb ('verb-framed' languages) or by a verb-particle or affix ('satellite-framed' languages). This distinction has proved fruitful when applied to many unrelated languages (e.g., Wienold 1995; Slobin 1997; Zlatev 1997), but when extending the database of languages and deepening the analysis, it has proved to be insufficient. For example, Zlatev (2003b) shows that due to its *serializing* character, Thai expresses manner-of-motion and path-of-motion in different verb roots: the first and second forms in (14) respectively, and thus exemplifies a 'third type'. Zlatev and Yangklang (2003) provide extensive support for this claim, and Slobin (2003) generalizes this type to include even languages other than serializing languages, calling the type 'equipollently-framed'.

(14) *dəən* *ʔɔ̀ɔk* *maa* *càak* *khâaŋ* *nay* *thâm*
walk go.out come from side in cave
manner path diexis path region
'walking out, (toward the deictic center) from inside the cave.'

Accounting for the cross-linguistic data has given rise to more comprehensive systems of spatial primitives which try to chart out universal characteristics as well as dimensions of possible variation (Svorou 1994; Sinha and Thorsheng 1995; Zlatev 1997; Senft 1997). A typology based on predominant frame of reference has been proposed (Pederson et al. 1998; Levinson 2003). Attention has also been devoted to the spatial semantics of Sign Languages from a typological perspective (e.g., Slobin and Hoiting 1994; Engberg-Pedersen 1999; Talmy 2001), showing more variation than previously expected and suggesting that properties that were deemed universal, i.e., the general nonconflation of 'path' and 'manner' in a single form, do not hold for Sign Language, and therefore are probably in part based on the nature of the vocal modality, which displays more linearity and less iconicity than the manual-brachial one.

In sum, the recent history of descriptive work in spatial semantics can be seen as a progression from an initial focus on English, combined with a strong universalistic bias, toward an increasingly larger typological database, allowing more appropriate generalizations with substantial, though non unconstrained, linguistic variation.

5. Theoretical Issues and Controversies

One of the main reasons why spatial semantics has been a field of such extensive study is its intermediary position between perception, conception, and language. In this way, it constitutes a convenient field for investigating some of the basic questions concerning linguistic meaning in general. In this section, I will briefly address four such questions that have been intensely debated in the literature.

5.1 Prelinguistic or Language-based?

At least three quite diverse standpoints on this issue have been adopted within Cognitive Semantics, with the first two echo the debates between 'conceptualists' and 'nominalists' from the Middle Ages (cf. Russell 1961), and the third being a more recent attempt to resolve the debate.

Semantic Categories as Conceptual Universals. The predominant view among cognitive linguists of the relation between semantic and conceptual spatial categories is that concepts such as 'path' and (various values for) 'region' constitute language-independent conceptual primitives (Talmy 1983; Lakoff 1987; Wierzbicka 1996; Mandler 1996). From this point of view, the function of language is simply to *express* (symbolize, lexicalize) largely spatial conceptual representations such as 'image schemas' (Johnson 1987), which are most often considered to exist prior to and independently of language:

> In each of these cases, the metaphorical and metonymic models exist in the conceptual system independently of the given expression. ... Similarly, the schemas for *over* exist for expressions in the spatial domain independent of the existence of *oversee*, *overlook*, and *look over*. What one learns when one learns these words is which of the

independently existing components of their meaning are actually utilized. (Lakoff 1987: 438)

While Jackendoff's conceptual primitives differ from Lakoff's in being 'digital' as opposed to 'analog', and his conceptual structures 'algebraic' rather than 'imagistic', his semantic ontology is similar: "Conceptual structure, as developed in Jackendoff (1983, 1990) is an encoding of linguistic meaning that is independent of the particular language whose meaning it encodes" (Jackendoff 1996: 5). In Jackendoff's view of the human mind, universal 'conceptual representations' (CR), defined by primitives such as PATH and PLACE, stand between an image-schematic 'spatial representation' (SR) and 'linguistic forms' (LF) and the connections between the representations are established by 'interface modules': SR ↔ CR ↔ LF. Given the assumptions of both types of conceptual universalism, the only way to account for language-specific semantic differences is through the *selection* of the underlying primitives and 'lexicalization patterns'.

There are a number of problems with this view. First, even in the universal domain of space, there is more cross-linguistic variation than predicted; consider, for example, the Korean notions of 'tight fit' and 'loose fit' which cut across English 'interior' and 'support' (Bowerman 1996). Furthermore, these are differences which are acquired early by children (Choi and Bowerman 1991), and there is no evidence that the children pass through a 'universalistic phase' as predicted by Mandler (1996). An additional problem for a universal conceptual representation constituting a kind of 'language of thought' is any corroboration of linguistic relativity/mediation; as pointed out, robust 'Whorfian effects' have been shown in the spatial domain with respect to frame of reference (Levinson 2003). A final problem specific to Jackendoff's model, though not to the 'imagistic' approach, is that actual sentences are two interfaces and one universal representation removed from Gestalt-like structures such as SR, while such 'background' structures clearly play a role for interpretation.

Semantic Categories as Usage-Based. The classic alternative to regarding meaning as based on nonlinguistic concepts is to view it as immanent in the usage patterns of the language itself. With respect to spatial meaning, this view has lately been defended by Bowerman (1996) on the grounds of extensive and developmentally early cross-linguistic variation. By distinguishing semantic and conceptual structure, however, Bowerman remains noncommitted on the question whether and to what degree these differences translate into conceptual differences. However, Langacker's (1987) view of meaning as 'conventional imagery' does imply a fairly strong version of linguistic relativity, though this is seldom acknowledged. From the premises "Semantic structure is not universal; it is language-specific to a considerable degree" (Langacker 1987: 2) and "Cognitive grammar equates meaning with conceptualization" (1987: 5) follows that conceptualization is language-specific. Indeed, Langacker's theory is even open to the interpretation that *perception* is language-specific, since it is claimed that "predication and perception are special instances of conceptualization" (1987: 130).

Of course, neither Bowerman nor Langacker are true 'nominalists', and thus do not face antinominalist arguments based on cross-linguistic universals and similarities between linguistic and prelinguistic structures. Bowerman (1996), for example, makes it clear that spatial semantic structure should be viewed as emergent from the interaction between both linguistic and nonlinguistic categorization: "The way children initially classify space for language is the outcome of a complex interaction between their own non-linguistic recognition of similarities and differences among spatial situations, on the one hand, and the way space is classified by adult speakers of their language, on the other" [33] (Bowerman

1996: 21). The problem is rather that the nature of this interaction is not analyzed, and in this way it is impossible to predict to what extent semantic and general conceptual structure would coincide.

Semantic Categories as Emergent from the Interaction of Motivation and Convention. The third possibility represents a synthesis of the preceding two in stating that spatial semantic categories are *based* on prelinguistic experience, hence broad cross-linguistic similarities are to be expected, but that they are conventionalized language-specifically, and hence that there should be differences. The spatial concepts presented in section 3 are compatible with this view, as it is embraced, for instance, by Zlatev (1997), Sinha (1999), and Talmy (2000). Regier's (1996) connectionist model of the 'human semantic potential' can be seen as an explication of the idea how a constrained, though flexible initial state can result in different spatial semantic systems depending on the semantic structure of the language being acquired. From this perspective, semantic, perceptual, and conceptual structure are related but remain separate (Levinson 1996). Categories of perception *motivate* categories of language, but do not determine them. Conversely, semantic structures do not determine perception. Conceptual structures that are largely culturally mediated, e.g., semantic and episodic memory, are (strongly) influenced by linguistic categories. Those which are less so, e.g., procedural memory, are not. By way of criticism, it should be mentioned that the interactionist position is the least constrained of the three, and requires considerable methodological sophistication in order to be elaborated.

5.2 Localized or Distributed?

If the first controversy concerned the 'semantic pole' of language, this one concerns the 'phonological pole' (Langacker 1987). As pointed out in section 2.1, it is commonly held that spatial meaning is expressed by the members of one (or more) closed classes; see, for instance, Talmy (1983, 1988), Svorou (1994), and Regier (1996). While these authors acknowledge that sometimes open classes such as nouns and verbs participate in the expressing spatial meaning, they usually insist that the grammatical elements have priority: "Lexical elements do incorporate some of the same structural indications that grammatical elements express, but when the two are in association or in conflict within a sentence, it is generally always the grammatical elements' specifications of structure that are determinative" (Talmy 1988: 165).

This view, however, is objected to, among others, by Brown (1994), Sinha and Kuteva (1995), Ameka (1995), and Zlatev (1997, 2003b), on the basis of many examples from typologically different languages, e.g., Tzeltal, Ewe, Japanese, and Thai. As Sinha and Kuteva (1995) argue, "An adequate analysis requires the abandonment of the localist approach, and the analysis of how spatial relational meaning is syntagmatically distributed over simultaneous selections from closed and open form classes" (Sinha and Kuteva 1995: 168). I have in earlier work endeavored to capture these facts within the theory of Holistic Spatial Semantics (Zlatev 1997, 2003b, 2003c) assuming representations such as that in Figure 13.2, which allows for a many-to-many mapping between semantic concepts such as those presented in section 3 and form classes, without privileging the closed classes. Conflation patterns (Talmy 1985), distribution patterns (Sinha and Kuteva 1995), and patterns of compositionality (Ameka 1995) appear as special cases of this kind of mapping. A problem with this approach, however, is that it is rather unconstrained: a more adequate theory would need to explain the range of cross-linguistic variation in the values of the semantic categories as well as in the various mapping patterns.

[INSERT FIGURE 13.2 ABOUT HERE]
Figure 13.2. A representation of expression-meaning mapping within Holistic Spatial Semantics (from Zlatev 1997)

5.3 Semantic or Pragmatic?

In contradistinction to traditional analyses (Grice 1975), which separate conventional semantic meaning from contextual and hence pragmatic interpretation, the dominant view in Cognitive Linguistics is that meaning, and hence spatial meaning, is encyclopedic and that there is no nonarbitrary boundary between semantics and pragmatics (Lakoff 1987; Langacker 1987). This view would imply a 'full specification' account of the meaning of the prepositions in (15) and (16) and state that the (a) and (b) sentences embody different senses expressing different profiled regions.

(15) a. John flew *over* the bridge. Region: SUPERIOR
b. John walked *over* the bridge. Region: SURFACE

(16) a. The room is *at the back of* the school. Region: INTERIOR
b. The tree is *at the back of* the school. Region: EXTERIOR

An alternative analysis is to state that the prepositions do not express the relevant distinction semantically, but that the relevant interpretation is derived through the Gestalt-like properties of the expressed situation (see the dashed line in Figure 13.2) and the background of practices (Herzkovits 1986; Zlatev 1997). This agrees with the claims of, for instance, Levinson (1991) and Kita (1999) that in many languages, central aspects of spatial meaning are often pragmatically inferred rather than (overtly) expressed. Zlatev (2003b) argues that a separation between semantics and pragmatics along these lines can provide important cross-linguistic (typological) generalizations, and is therefore to be preferred.

5.4 The Analysis of Spatial Polysemy

An claim often made in cognitive semantic analyses is that lexical items, and particularly spatial ones, are strongly polysemous, i.e., characterized by a multiple set of distinct, but systematically related senses (Lakoff 1987; Langacker 1987; Deane 1988; Cuyckens 1991; Geeraerts 1993; Regier 1996; Tuggy 1999; this volume, chapter 4). These analyses are usually represented by networks of nodes representing different senses connected via asymmetrical links. The terms for these asymmetrically linked nodes/senses may vary with the particular network model, e.g., 'prototypical' vs. 'extended' (Langacker 1987), 'central' vs. 'peripheral' (Lakoff 1987), but in all cases one node of the relation is seen as cognitively more basic than the other. One of the best-known applications for this kind of analysis has been precisely the semantic study of spatial expressions, where nonspatial senses are (nearly) always treated as extensions from the spatial ones.

But what exactly is the status of such polysemy networks? Are they a characterization of *psychologically real* structures and/or processes and thus relate to the individual psychological level or are they *descriptive generalizations* over the use potential of the expressions in question? Since the latter is derived on the basis of speakers' intuitions of the appropriatness (or 'correctness') of a particular expression when applied to a particular situation, they obviously represent theoretical explications of the normative (nonobservable) level of language. As pointed out in section 2.2 the two kinds of linguistic reality (the individual-psychological and the collective-normative) do not coincide, and therefore it

cannot be assumed that a particular analysis (of polysemy) should satisfy simultaneously the criteria of linguistic explication and psychological explanation. This pervasive mistake of equating "linguistically real" with "psychologically real" seems to be inherited by Cognitive Linguistics from the Chomskyan tradition, and can be seen with respect to polysemy in the following statement: "The central member is thus the member from which all others can be most plausibly and most economically related ... Degree of centrality certainly seems to be a psychologically and linguistically real notion" (Taylor 1989: 119). What is "central" from the standpoint of analysis need not be so pychologically, and vice versa.

The question of the status of polysemy networks is raised poignantly in the title of Sandra and Rice's (1995) study: "Network analyses of prepositional meaning: Mirroring whose mind – the linguist's or the language user's?" The focus of Sandra and Rice's critique is on the representational and methodological vagueness of network analyses. In particular, the authors consider "the problem of determining whether the fine distinctions are part of the mental representation (as predicted by the prepositional network approach) or the result of an interaction between monosemous mental representations and a process of contextual supplementation" (Sandra and Rice 1995: 125). It is significant that the evidence adduced in a number of psycholinguistic studies, most of which are summarized in Cuyckens, Sandra, and Rice (1997), by and large does *not* support the (active) mental representation of polysemous networks with spatial prototypes and metaphorical extensions. In brief, first language acquisition studies do not show spatially 'transparent' uses to be regularly acquired before the more abstract and idiomatic ones (van Geert 1995; Rice 1999; Zlatev 2003a). In second language acquisition, speakers tend not to transfer hypothetically polysemous L1 representations into L2 (Frisson et al. 1996; Rice, Sandra, and Vanrespaille 1999). In sentence sorting and similarity judgment tasks, subjects do not regard supposedly polysemous spatial and nonspatial senses to be more closely related than homonymous (i.e., nonrelated) controls (Sandra and Rice 1995; Rice, Sandra, and Vanrespaille 1999). Finally, and most crucially, primed lexical decision tasks (Sandra and Rice 1995) show that spatial senses of the prepositions *at*, *on*, and *in* do not facilitate, but rather inhibit, the recognition of examples with temporal senses, thus attesting to separate mental representations for the prepositions' spatial and temporal usages. While individually each one of these studies may not yield conclusive results, taken together, they strongly question both the existence of polysemy networks and the primacy of space—as far as the individual-psychological level of linguistic reality is concerned—thereby simultaneously going against two of the foremost tenets in Cognitive Linguistics.

At the same, this does *not* invalidate analyses of polysemy as explications of the level of linguistic norms/conventions. Such explications do need to be made accountable to criteria of "descriptive economy, naturalness, generality and explanatory power" (Cuyckens, Sandra, and Rice 1997: 51), *pace* the comments of these authors on this issue. As pointed out in section 2.2, it is exactly these criteria which have been adduced to in arguing for and against various analyses of the polysemy of *over* in the Cognitive Linguistics literature. In one of the latest contributions to this debate Tyler and Evans (2001: 733) state the need for a "methodology … that provides a rigorous and relatively constsitent way of making judgements about whether a sense is distinct, and … can be used in an intersubjective way" and propopose one such methodology which they call the "principled polysemy" approach. Endeavours such as this are just as important for the analyses of polysemy on the normative level, as experimentation is for the psychological one. Only with more progress in each may we hope that the two levels can be eventually meaningfully related.

6. Summary and Guidelines for Future Research

The review of cognitive linguistic research in spatial semantics presented in this chapter involved a discussion of the theoretical self-understanding and methodological practices within the field (section 2); a description of basic spatial semantic concepts, showing a rather unexpected degree of cross-theoretical similarity (section 3); a brief survey of spatial semantic descriptive work (section 4); and finally an outline of four important theoretical controversies that any theory of spatial meaning would need to address (section 5). On this basis, the following generalizations concerning the present status and guidelines for future development can be suggested:

a. *Conceptually*: The existence of different ontological levels of linguistic meaning, each with its appropriate methodology, should be more widely acknowledged, and along with that, the social normative level, accessible through 'intersubjectively valid intuitions' should be rehabilitated.
b. *Theoretically*: Further analytic work should be carried out in relating the conceptual and descriptive systems of various authors, showing where disagreements are only terminological and where they are substantial. In the latter case, one could attempt to find a theoretical synthesis, offering a resolution of the persistent theoretical controversies.
c. *Descriptively*: The typological database should be extended with new languages, allowing even better cross-linguistic generalizations. Furthermore, *diachronic* evidence (when available) should be taken into account to a greater degree, since it is likely that language change can help to provide an explanation of patterns of polysemy and the primacy of the spatial domain, in conjunction with synchronic psychological processes.
d. *Psychologically*: The psychological studies reviewed have provided more questions than answers: Is there a principled way to distinguish polysemy from homonymy, on the one hand, and from generality, on the other? In which way does language mediate spatial thinking? etc. The existing experimental paradigms need to be cross-checked for converging evidence, and new types of experiments should be considered. A valuable new source of evidence for uncovering parallels between the linguistic and conceptual structure of space may be provided by gesture studies (e.g., McNeill 2000; Kita and Özyürek 2003).
e. *Computationally*: Computational simulations should be explicitly related to the appropriate level of linguistic reality they intend to model. A more adequate basis for the study of 'embodied' spatial representations could possibly be found in the emerging paradigm of 'epigenetic robotics' (Dautenhahn 1999; Steels 1999; Zlatev 2001; Zlatev and Balkenius 2001.)

Finally, these studies will stand to profit if they can be carried out in parallel, in a collaborative nonreductionist manner—avoiding fruitless arguments concerning which level and methodology is properly entitled to the adjective 'cognitive'. In accordance with the interdisciplinary and nonmodular character of Cognitive Linguistics, the modifier 'cogntive' would be most appropriate for the approach that manages to *integrate* the different ontological levels and methodologies most coherently.

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Notes

1. The approach bears similarities to Rohrer's (1998, 2001), who proposes a framework of 'levels of investigation' and applies this to the study of metaphor and frames of reference. The major difference Rohrer's approach and mine lies with the way the levels are defined: Rohrer refers to 'size' and 'physiological structures' while I hold that the differences are basically ontological: language exists differently at the three basic levels—as a social institution, as mental representation and as a neural implementation.

2. A crucial point is that one should distinguish *intuitions* about the normative realm, which are in general 'intersubjectively valid' from *introspection*, which is about the contents of individual minds. Notions such as 'image-schema transformations' deriving originally from introspection will be useful as a tool for explicating our shared intuitions only to the extent that they help capture generalizations.

3. Cuyckens, Sandra, and Rice (1997) provide a summary of most of the work referred to in b.– d.

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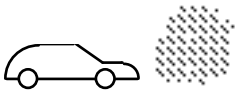
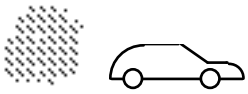
naka Region: INTERIOR 	*soto* Region: EXTERIOR 	FoR: OBJECT-CENTERED
chikaku Region: PROXIMATE 	*aida* Region: MEDIAL 	FoR: OBJECT-CENTERED
ue Region: SUPERIOR 	*shita* Region: INFERIOR 	FoR: OBJECT-CENTERED
mae Region: ANTERIOR 	*ushiro* Region: POSTERIOR 	FoR: OBJECT-CENTERED or VIEWPOINT-CENTERED
temae Region: CITERIOR 	*mukoo* Region: ULTERIOR 	FoR: VIEWPOINT-CENTERED

Figure 13.1 Japanese locative nouns expressing the spatial semantic category *region*

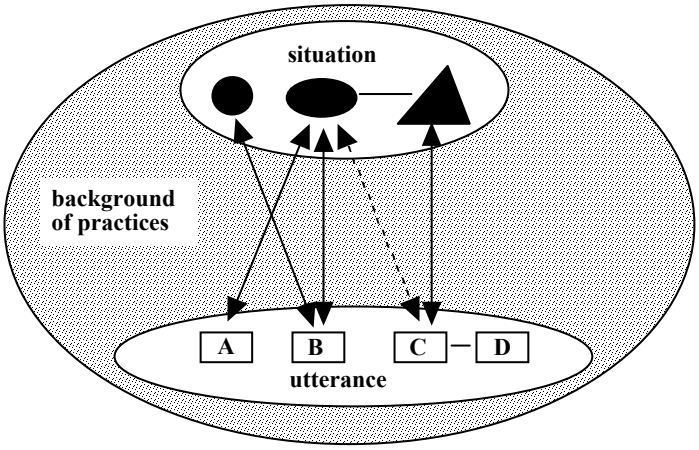


Figure 13.2. A representation of form-meaning mapping within Holistic Spatial Semantics (from Zlatev 1997)