Semantic and Conceptual Aspects of Local Expressions: Critical Remarks on the 'State of the Art'

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Abstract

In most current treatments to the semantics of local expressions, the ontological concept 'region' is utilized and formalized in order to define spatial relations. In this paper it is argued that, both on theoretical and empirical grounds, this "region account" is seriously flawed. An alternative compatible with some central aspects of the "two-level semantics" of Bierwisch/Lang is proposed which emphasizes the importance of the reference to *cognitive* aspects of the representation of space. It is suggested that focused spatial attention plays a central role in defining spatial relations and thus in the semantics of local expressions.

1 INTRODUCTION

Within a cognitive linguistic paradigm, a theory of the semantics of spatial expressions crucially depends on assumptions about basic properties of conceptual representations of space. Such assumptions about the ontological structure of spatial knowledge are necessary to allow for a systematic treatment and formal description of the pertinent semantic phenomena. Based on the seminal work of Miller/Johnson-Laird (1976), some proposals have been made in which certain mappings from linguistic expressions to (relations between) ontological entities like 'object', 'region' or 'path' are specified.

However, although this meant a tremendous progress with respect to *intra*disciplinary research, there are some problems (closely related to one another) to be noted from an *inter*-disciplinary cognitive science point of view. First and foremost, there still seems to be an on-going general discussion whether semantics is to be spelled out in terms of mathematics or psychology, that is, how matters of the form and content of a semantic notation are to be reconciled. As I will show below, this does not only reflect different conceptions of 'semantics' but has also subtly influenced some of the mentioned proposals for spatial semantics. Second, psychological evidence for the proposed representational constructs is largely missing. Compared with other topics, little work has been done to investigate aspects of the spatial relations adressed by spatial expressions. Third, with 'regions' and 'paths' being defined as sets of spatial points and sequences of such sets, respectively, real space seems to be represented simply by some kind of internal space. Below I will argue that this begs the question of how space is mentally represented. As an alternative, I will propose that space is conceptually represented as categorized perception of space, with focused spatial attention playing a central (selective) role. This puts an emphasis on the experiential basis of cognitive space representations and on the connection between language and perception. Fourth, there are linguistic data that call into question some of the assumptions of these proposals which again has repercussions on the adequacy of the proposed constructs.

In this paper, these problems will be discussed in some more detail. It will be argued that it is necessary to keep apart aspects of form and content of a semantic notation and that for a semantics to be 'cognitive', its function as an interface between linguistic and conceptual representations has to be taken seriously.

2 SEMANTICS, COGNITION, AND FORMALIZATION
### 2.1 *The "Semantics of Deceptions"*

In his review of Jackendoffs monograph "Semantics and Cognition", Werner (1989, p. 166) writes the following (this and further citations translated by me):

> "Jackendoffs monograph can be regarded [...] as a 'paradigm': as a characteristic example of the misleadingness and inevitable failure of all 'mentalistic' [...] endeavours, as far the question of the semantic description of natural languages is concerned."

How does he arrive at this conclusion, which seems to be devastating for cognitive semantic approaches (note that his "mentalistic" can be legitimately replaced by "cognitive(ly oriented)")? Part of the answer to this question can be traced back to Werner (1985), where he presents a long list of deceptions semanticists have –according to his opinion– succumbed to until now. Three of them are relevant for the current paper. First, the *metasyntactic* deception, which corresponds to the infamous mistake (also known as "markerese") of simply translating natural language into an arbitrary symbolic notation, albeit with a specified mapping from words to symbols and with a specified syntax for symbolic strings. Second, the deception of *intuitionistic interpretation*, which is true for those semanticists who strive to give an interpretation to their symbolic notation but only do so intuitively or informally. Third, the *isomorphistic* deception that holds if an interpretation of a symbolic notation is only given by way of a postulate of isomorphy such that the interpretation of a certain symbol is alleged to be fixed by the mapping. Werner correctly points out that this kind of semantics is devoid of any empirical control.

Now, according to Werner, these and other deceptions can only be avoided by rigid mathematical formalization. Thus, semantics is not to be described in terms of an arbitrary symbolic language, but "in terms of a [...] *Language of Mathematics*, [...] a language of (axiomatic) *Set Theory*" (Werner 1985, p. 503). On this background, Jackendoff not only is blamed for being subject to some of the semantic deceptions (for example, the metasyntactic one, see Werner 1989, pp. 164ff) but apparently also does not take Werner´s formal point of view: "My thesis is [...]: to study semantics of natural languages *is* to study cognitive psychology" (Jackendoff 1983, p. 3, cited in Werner 1989, p. 163)[1].

The moral of Werner´s analysis seems to be the one presented in figure 1. Obviously, the "cognitive" and the "formal" paradigm (with Jackendoff and Montague as prominent instances) can be compared easily on a complex scale "formality and goodness of approach" with the greater value for the Montague paradigm.

formality
&
goodness of
approach

Montague paradigm

Jackendoff paradigm

figure 1
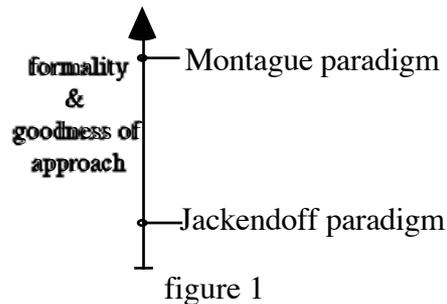
If this is what Werner has in mind with his critique, I am strongly convinced that he is wrong. The key for proving this is to show that there is no such simple relationship between formality and goodness or, in other words, that he confounded two aspects which in fact have to be kept separate. In addition to this, I will point out the need to clarify the role of formalization in cognitive semantics and to a specific problem which arises if the role of formalization is misconceived.

2.2 *Introducing the 'ontological deception'*

How can the role of formalization in theory building be characterized? Without doubt, formalization must be regarded as a useful and necessary **method** for the verification of a theory (with respect to correctness, completeness, and independence, see Partee et al. 1990, p. 47f) as well as for heuristic proceeding (that is, to try to transfer formal patterns onto as yet unanalyzed domains). Probably, formalization is not only relevant for these aspects, but may in part also be relevant for some others: In accord with Werner it can reasonably be assumed that mathematics is most suitable for dealing with aspects of compositionality, set structuring etc.

However, it is important to note that formalization ultimately is *descriptive*. It therefore does not replace a content theory and, correspondingly, does not itself yield a theoretical paradigm. Instead, it always depends on external evidence for the usefulness and adequacy of the basic entities it operates with. Furthermore, as Werner correctly states in his above quotation, it still can be regarded as a translation of a domain to be formalized into a formal language (the mentioned language of mathematics). From this, it follows that every formalization can only be as good as the content theory that is formalized. Thus, there might be non-formalized good theories that are better than formalizations of bad theories. Because of this, the simple picture in figure 1 must be rejected.[2]

I will now propose to use the description **"ontological deception"** for cases in which the methodological status of formalization is disregarded. It is applicable if the relevance and/or verifiability of the used basic entities is questionable, that is, if there is no sufficient empirical evidence for their use. I will further suggest an alternative to Werner´s view on the relation between semantics, mathematics, and psychology. This alternative is based on one of the aspects of the so-called **two-level semantics** (see especially Bierwisch/ Lang 1989), which explicitly postulates the semantic level (as central part of semantics) to be the interface between two cognitive systems (the linguistic system and the knowledge or conceptual system) such that the meaning of a linguistic expression can be construed as a context dependent mapping from the semantic level to the conceptual level.[3]

The key to my proposal lies in the observation that within cognitive semantics, **re**-lating representations (linguistic and conceptual) is the relevant notion to talk about as opposed to

trans-lating languages (from natural to symbolic/formal). Thus the following picture emerges: cognitive semantics is a *part of linguistic theory* (in that it accounts for the meaning assignment of linguistic expressions), is *rooted in psychology* (as the theoretical constructs needed to specify an interpretation for expressions are outside linguistics) and can/must be *modelled mathematically.*

This characterization has some implications for the methodological requirements of a cognitive semantic theory: Its assumptions must be motivated and justified by linguistic data; they must be compatible with psychological theories; and they must be made explicit by formalization. Note that in this view the ontological burden will be taken off formalization as the task of providing an interpretation as well as empirical evidence for the used basic entities will be passed over to cognitive psychology. It follows from this that linguists and psychologists have to work together to come up with good theories to be formalized, and furthermore, that Jackendoff is right with his above statement.

2.3 *The 'ontological problem'*

To introduce what I regard as a subtle but important problem within (cognitive) semantics, I have to cite Werner again:

> "In reality, the work of a computational semanticist as a 'common-sense semanticist' will basically consist in performing a semantic analysis of certain linguistic constructions which is plausible or intuitively evident for him and either done by introspection or based on common psychological opinion, that is, exclusively with the aid of certain general or possibly contextspecific [...] technical terms – that is, based on **extremely vague notions**, and that means here: **notions which have not been subject to a formal reconstruction or logical explication so far** [...]" (Werner 1985, p. 494, my emphasis)

Alas, I have to reply, a vague but **inadequate** notion will not become better through formalization unless a heuristic loop or interaction of theory building and formalization is tacitly assumed![4] I will call this problem of expecting too much from formalization, and of sometimes even falling prey to the ontological deception, the **"ontological problem"** of semantics. My assumption, which I will provide evidence for soon, is that the ontological problem currently occurs in the field of spatial semantics, too.

If one adopts the cognitive point of view I have taken, the question arises as to how the conceptual representations underlying the use of spatial expressions are to be described. Plainly, what is a spatial (or local) relation?

3 THE REGION ACCOUNT TO LOCAL RELATIONS

In their monograph *Language and Perception*, Miller/Johnson-Laird (1976) made some influential proposals in this respect. For the treatment of local expressions (e. g., prepositional phrases like "in front of the house", "near the tree" etc.) they introduced the concept 'region' to represent spatial areas that might function as *search domains* relative to a given reference object (RO) in which the located object (LO) has to be looked for. A local relation thus was regarded as an inclusion relation of LO in a RO-dependent region (an example for this, the semantic schema for *on*, is given in (1).

(1) ON(x, y): A referent x is "on" a relatum y if:
    (i)   (INCL(x, REGION(SURF(y))) & SUPRT(y, x));
           otherwise go to (ii)
    (ii)   PATH(y) & BY(x, y)

    "x is on y either if x is included in the surface region of y with y supporting x, or if y is a path and x is by y"

Note that with 'region' a rather *vague notion* was introduced — an intuitive concept that somewhat directly reflected the uncertainty about the exact place of LO and, on the other hand, the need to restrict its possible places for each preposition.

Wunderlich (1982) took over this idea in an attempt to unify and generalize the semantic treatment of local prepositions. Most importantly, he *formalized* 'region' by providing it with a clearcut mathematical interpretation according to which it is assumed to denote a *set of SPATIAL POINTS*. Based on this, he defined a family of preposition-specific region constitution functions u_j (also described by the metavariable PREP*) whose values could be said to contain the place of the located object. This yields (2) as a general pattern of the semantic representation of local prepositions (3) is an alternative, widely used notation). With π (place-function) mapping an object onto the region it occupies, one thus gets a unique and plausible interpretation of the concept 'local relation': the containment of regions in regions.

(2) $\lambda y\, \lambda x\, [\ \pi(x) \prod u_j(y)\ ]$
(3) $\lambda y\, \lambda x\, [\ LOC(\pi(x), PREP*(y))\ ]$
(4) $\lambda y\, \lambda x\, [\ LOC(\pi(x), PREP*(y))\ \&\ C(x, y)\ ]$

Within this framework, which by now has become a standard at least in German linguistics, some functions (and their corresponding ontological regions) have been agreed upon: INT(y), an adequate interior of y and therefore a subregion of $\pi(y)$ (-> *in*); PROX(y), the proximal region of y that includes INT(y) (-> *to, from*); EXT(y), the exterior proximal region of y, that is, PROX(y) without INT(y) (-> *an, bei*); DIST(y), the complement of PROX(y); sections of EXT(y) modelling the regions relevant for projective prepositions (-> *in front of, behind* etc.). In Wunderlich/Herweg (1990), further aspects of local prepositions are taken into account by allowing additional conditions C(x,y) in the semantic representations (4). These and other developments show that this approach has been fruitful for the investigation of local expressions due to its clear formal basis. On the whole, it seems that with the use and formalization of 'region' a suitable account for the representation of local relations and their role in spatial semantics has been found.

4 PROBLEMS OF THE REGION ACCOUNT
4.1 *General considerations*

I want to argue that the foregoing conclusion is fundamentally misled. In my view, the above treatment is a clear instance of the ontological problem, and, even worse, of the ontological deception. This is supported by the observation that *there are no SPATIAL POINTS, neither in real nor in mental space*! Therefore, although the formalization of the vague notion 'region' is intended to provide it with a clear interpretation, this must be regarded as an illusion. Too

much is expected from formalization (-> *ontological problem*) and at the same time its methodological status is overlooked (-> *ontological deception*). Even if there were reasons for introducing spatial points they would have to be given an interpretation for themselves. Thus, systematicity tacitly assumed, a *metasyntactic deception* can be identified on the formal level.

It might be objected that the assumption of spatial points is not necessary for a formal treatment of 'regions'. One could postulate a structured domain of REGIONS in order to achieve the same, required result. However, as long as there are no distinct (linguistic or psychological) justifications for doing so, 'regions' are described by REGIONS, corresponding to the *isomorphistic deception* mentioned above. Thus, we have finally arrived at the question of whether some evidence in favor of the discussed approach exists, that is, whether REGIONS can be legitimately regarded as basic entities in a theory of spatial representations and semantics.

In cognitive psychology, little evidence for REGIONS as representational entities can be found. First of all, it should be clear that REGIONS corresponding to expressions like 'near the Plaza Hotel' are categorical in nature. Therefore they cannot be reduced to the spatial properties of, for example, topographical space projections in the brain or analogical representations ("mental images", see Kosslyn 1980). In general there can be no simple isomorphism from external to internal space (Palmer 1978). Furthermore, in spite of the fact that "region" is used in many different ways in psychology (for example, as the result of coloring a certain area in a visual percept (Ullman 1984), as a basic unit of perceptual organization (Palmer 1992, Palmer/Rock 1994), or as parts of interactional space (see especially Miller/Johnson-Laird´s "region of interaction")) only Miller/Johnson-Laird come close to the categorical sense. However, they use it in an intuitive, informal way such that representational aspects remain unclear (that is where the region account started).

So what about linguistic evidence? As described, the use of 'region' was borrowed from psychology and, according to the present approach, seems to fit the linguistic data. Because of this, I will be solely concerned with *counter-evidence* in the following.

4.2 *Linguistic counter-evidence to the region account*

Recall that in the semantics of local prepositions a certain spatial region of RO is *explicitly* used to locate LO in it. This is plausible for cases like "near the Plazahotel", "in the house", etc. However, there are objections to each single aspect of this characterization. First, not all of a local preposition´s senses are spatial in the same way or even spatial in nature. As an example, consider the uses of *in* in (5). Although the place of oxygen can be said to be included in the place of the air, the "part-of" reading of *in* in (5a) is to be distinguished from, e. g., "The clouds in the air". To locate the pain in the knee (5b), a mapping from abstract to concrete seems to be required. In (5c), localization evidently takes place in the abstract domain. How does an approach that relies on spatial properties cope with these examples and is able to permit a gradual shift from concrete to abstract readings?

(5) (a) Sauerstoff in der Luft (b) Schmerz im Knie (c) Fehler im Algorithmus
          Oxygen in the air   *Pain in the knee*   *Bug in the algorithm*

(6) (a) Loch in der Wand (b) Lücke in der Linie (c) Vogel im Geäst
          Hole in the wall   *Gap in the line*   *Bird in the boughs*

Second, for "negative objects" (denoting the non-existence of object matter) like the ones in (6a,b), cognitive completing operations (e. g., the Gestalt principle of "Good form"; compare the "normalized region" and "outline" of Herskovits 1986; see also Herweg 1989) have to be assumed in order to build the regions required for localization (note that the LO really is <u>not</u> located in a region of RO itself). The same holds for cases like (6c). In my opinion, this looks more like a repair of the region inclusion theory than like a special case of it.

Third, not only are there canonical regions (inner, outer, proximal, distal regions etc.) and less canonical regions ("Good forms") to be postulated. As the examples in (7) show, specific regions for projections (7a,b) and forms (7c,d) are needed in addition. Most clearly exemplified by (7e), however, the introduction of these regions is to be regarded as basically *post hoc*![5]

(7)   (a)   Mond im Fenster (b)   Bild im Spiegel   (c)   Delle im Auto
             Moon in the window   *Picture in the mirror*   *Dent in the car*

       (d)   Falten im Papier   (e)   Knoten im Schnürsenkel
             Crinkles in the paper   *Knot in the shoelace*

Fourth. There is a generalization of the "post hoc"-ness aspect which can be observed with respect to the region account: a shift from specifying the semantics of local prepositions to specifying the characteristcs of a certain region (see the isomorphistic deception above). This problem of getting empirical evidence for the proposed constructs is not easily detected but becomes obvious, for example, in attempts to specify the distinction of the prepositions *an* and *bei* (which corresponds roughly to the English distinction of *at* and *by* or *close to* and *near*): While Pribbenow (1993) assumes two regions (AN*- and BEI*- regions, respectively) that differ in spatial extension, Herweg (1991) proposes to let both prepositions refer to the EXT-region with the necessary distinction handled by a pragmatic implicature.[6]

Fifth. In (8a), an expression of small distance is combined with (that is, modifies) a local relation of small distance (proximality). According to the region account this can be paraphrased as "LO is located in the EXT/AN*/BEI* region and the distance to RO is 1cm". Notice that there is nothing special about this. Thus it remains unclear why (8a) should come out as inacceptable – as it does according to some kind of conceptual incompatibility of the preposition and the distance expression. One possibility to save the region account in this respect would be to treat every distance expression as 'distal' in order to get the required incompatibility. However, this would be an ad hoc solution, which would amount to a rather idiosyncratic meaning of "distal". Alternatively, the proximal regions could be blamed for a lack of a dimension to be quantified by a distance expression. This hypothesis must be abandoned because of examples like the one in (8b) where the combination is acceptable although "nahe" only differs in polarity to "weit" (see Bierwisch/Lang 1989 for the semantics of such adjectives). In addition to that it is unclear how modification is possible at all as the regions to be modified are *encapsulated* as arguments of the localization relation. Thus, the region account is unable to correctly deal with the (in)compatibities. It can be reasonably supposed that this is due to the explicit and direct reference to spatial properties and with this, to the neglect of conceptual level properties.

(8)   (a)   *1 cm weit an/bei der Wand   (b)   nahe an/bei der Wand
             1cm far close to/by the wall   *near at/by the wall*

Sixth. As has been shown in more detail in Carstensen (1992), current assumptions about the argument structure of prepositions and adjectives, and about the syntactic and semantic

aspects of their combination, pose some severe problems. In (9), the proposed semantic entries for distance adjectives and local prepositions are given. They show that distance and local *phrases* are treated semantically as *properties of objects* (see 10) and that modification of a local PP by a distance AP is represented as a unification of these properties (see 11).

(9) (a) distance adjective: $\lambda c \, \lambda x \, [QUANT \, (DIST' \, (y, x)) = [v \pm c]]^7$
     (b) local preposition: $\lambda y \, \lambda x \, [LOC(x, PREP*(y))]$
(10) (a) distance AP: $\lambda x \, [QUANT \, (DIST' \, (y, x)) = [v \pm c]]$
     (b) local PP: $\lambda x \, [LOC(x, PREP*(y))]$
(11) high above the clouds
     $\lambda x \, \exists c \, [\, LOC(x, ABOVE*(CLOUDS)) \, \& \, QUANT \, (VERT(DIST' \, (z, x))) = [v \pm c] \,]^8$
(12) weiter Weg, weite Reise
     far way, far travel

However, besides the failure to adequately handle the (in)compatibilities in (8) there are further weaknesses of this approach. One of them concerns the combinations of *weit* with *NPs* (see 12). If, according to (9a), the semantics of a distance adjective is construed as a ternary predicate, then one gets a wrong result with respect to (12). Contrary to the preferred sense 'a way /travel that has a great distance' one only gets the reading 'a way/travel that is located in a great distance from some other object'. If, on the other hand, (12) is taken as evidence against (9) such that distance adjectives are treated like dimensional adjectives (that is, as binary predicates), modification in the form of (11) does not work any longer. This, in turn, is a hint at some inadequacies in the current semantics of local prepositions.

There are three related aspects that substantiate this suspicion, all pertaining to the combinatorics of APs and PPs. First, observe that one can distinguish two different syntactical readings of expressions like (13): "above the sea with a distance of 100m from it" and "100m away from (for example) the speaker and above the sea". In the first reading the distance information modifies the vertical *relation* while in the second one it modifies an empty local relation and, on the whole, modifies the *location* specified by the vertical relation. This corresponds to the structures (14a) and (14b), respectively. Yet according to the modification analysis of (11), no semantic clue is available for distinguishing the different readings.[9] With respect to the expression in (11), no *preference* can be established for the "narrow" reading (like the one in (14a)) because no difference is made between relation modification and location modification.

(13) 100 m weit über dem Meer
     100m far above the sea
(14) (a) [PP 100 m far above the sea]
     (b) [PP [PP 100 m far] [PP above the sea]]

(15) high below the clouds
(16) *[PP [AP 100 m high] [PP [AP 100 m deep] [PP above the sea below the clouds]]]

For the same reason, *inacceptable* readings cannot be recognized. Since (14a) and (14b) are not differentiated, the fact that there is only one reading for (15.a) (the "wide" one) is overlooked.

Finally, it is not possible to rule out *ungrammatical* expressions like the one in (16). Both the current semantic analysis (equal property status of APs and PPs) and the syntactic

treatment (AP adjunction to PPs; see Wunderlich/Herweg 1990) predict more freedom of combination than is actually allowed.

Let me summarize the problems of the region account to local prepositions. Generally, it does not fulfill the requirements of a cognitive semantic theory as stated above. It is not well motivated and justified by the linguistic data, there is at best little psychological evidence for the representational constructs used and, consequently, its formalization is flawed due to the ontological deception. Specifically, the assumption of 'regions' as basic entities (leading to the ontological problem) as well as their explicit use in localization relations (leading to their encapsulation and with this to modification problems) is highly questionable. If this argumentation is correct, we are back to the question of what a local relation is and how it is conceptually represented.

5 A NEW PROPOSAL

A problematic assumption implicit in the region account seems to be that *all* of mental space is inherently *spatial* (such that, e. g., topological properties of external space are preserved) and that spatial expressions are to be interpreted with respect to this space. Notwithstanding the existence of analogical representations of external space, this assumption must be abandoned (as it would imply a *direct* morphism from external to internal space; see above[10]). Instead of this, a filter mechanism must exist which reduces the vast amount of perceptual input and on principle leads to categorical representations. Unlike simply postulating such kinds of representations, however[11], I want to argue that there are categorical representations of the *perception of space*, which *indirectly* serve as representations of space and which provide the ingredients of local relations.

Recent research in visual perception (Theeuwes 1993) suggests that the operation of focused attention can be viewed as part of the mentioned selective mechanism. In some theories, focused attention is viewed as a "spotlight" that is cast on a salient item of the visual field in order to select it for conceptual processing. There are (at least) three interesting aspects of this mechanism: First, unlike the parallel preprocessing of the visual field, focused spatial attention acts *serially* in selecting one item after another; second, it operates on a spatial medium (the so-called "map of locations", see Treisman 1988) which is a distinguished locus of featural integration; third, there is evidence that focused attention on an object operates on distinct object representations ('object files', Kahneman/Treisman 1992) and gets represented itself (Sperling et al. 1992). In Carstensen (1993), I have elaborated on these aspects and shown that categorical representation of focused attention might be relevant for the representation of 'paths', on which the semantic analyses of some spatial expressions (in that case the verbs *to follow* and *to lead*) are based.

Although I cannot go into as yet undeveloped details, I want to suggest that the conceptual representation of changes of focused spatial attention constitutes a mental dimension which also underlies some (or most)[12] of the local relations adressed in this paper. I presume that by reference to this dimension many of the problems listed above can be avoided. Observe that the change of focused attention from one object to another can be regarded as establishing a "relation" between these two objects (see Logan 1994 for a similar attempt of bringing attention theory and spatial semantics together; see Landau/ Jackendoff 1993 for a related research effort). Thus it is not necessary to "explicitly locate" a LO in a region of a RO. Instead, one has to "explicitly characterize" different types of focus changes. No doubt, finding out which types there are and how they relate to local expressions is the next thing to do.

6 CONCLUSION

Let me summarize the main points of this paper. In the first part, I showed that there is no contrast of "cognitive" and "formal" approaches to semantics and, correspondingly, no direct relation between degree of formality and goodness of a semantic theory as has been postulated by Werner. I pointed out that overlooking the status of formalization (that is, being merely a method) leads to what I have called "ontological problem" and neglecting it to the so-called "ontological deception" (the illusion of being able to provide an adequate interpretation for natural language expressions by way of formalization). I presented an alternative view –compatible with two-level semantics and congenial to the work of Lang (e. g., Lang 1989)– by which a semantic level is regarded as an interface between cognitive representations thus relating linguistics and cognitive psychology. According to this view, cognitive semantics does not need to provide an ultimate interpretation for the basic conceptual entities it posits (in order to explain the linguistic data). Instead it has to show that they are motivated by and/or compatible with psychological theory of conceptual structure (which itself might profit from linguistic considerations). Therefore, these basic entities (or 'primes') may legitimately be used *directly* for interpretation in formalization, without being subject to one of Werner´s deceptions.

In the second part, I showed that current treatments of the semantics of local expressions are "ontologically deceived" with respect to their explicit use of REGIONs as formal counterparts of the vague notion 'region'. As an alternative to the "region account", I proposed to consider the role of focused spatial attention as central for the characterization of local relations and, more generally, for the mental representation of space.

NOTES

[1] Apparently, Jackendoff´s statement is ambiguous: In the strong reading, semantics is placed within psychology; in the weak reading, psychology somehow is essential for doing natural language semantics. Of course, I only subscribe to the weak reading (and I think, Jackendoff would do so, too). It is unclear to me whether Werner had the strong reading in mind. In any case, he even believes the weak reading to be wrong and disproven long since. I hope that this paper succeeds in showing that the weak reading is correct.

[2] This view is corroborated by the work of Verkuyl/Zwarts (1992), which has shown that Jackendoff´s theory can be given a standard model-theoretic interpretation.

[3] For the similarities and differences to Jackendoff see the epilogue of Bierwisch/Lang 1989.

[4] I hasten to add that it is just this interaction of theory building and formalization on which the benefits of the latter can be pinpointed: Formal systems provide a useful and interindividually comprehensible test bed for informal theoretical assumptions. However, since a computational semanticist is one of the first to subscribe to this (see, for example, Lang/Carstensen/Simmons 1991), it is evidently not what Werner means.

[5] The knot is neither located in the matter, nor in an inner region, nor in a "Good form" . . . but in the region which is needed to locate the knot in it.

[6] Much more could be said about this controversy, but I have to postpone it to another occasion. In this context, it suffices to point out that the first approach – although meeting the intuitions – is an instance of the intuitionistic and isomorphistic deception and that the

second approach – although based on a meticulous analysis of the linguistic data – fails to account for the intuitions in some cases (see Herweg´s own discussion in Herweg 1991).

[7] [v + c] characterizes the unmarked adjective *weit*, [v - c] characterizes *nahe*. The internal structure is to be read as follows: "The quantity of the distance from y to x equals a value composed of a comparison value v and difference value c".

[8] The VERT-functor characterizes a vertical orientation of the distance.

[9] See Hemforth et al. (1992) for some evidence that the mental parser exploits semantic clues in the course of syntactic parsing.

[10] See also Kuipers´ critique of the 'mental map' analogy of cognitive spatial representations (Kuipers, 1983).

[11] As a matter of fact, REGIONS could be – and sometimes are – interpreted in this way.

[12] I strongly believe that *not all* prepositions address focus changes. *In* seems to be a case in point.

REFERENCES

Allport, Alan (1989): "Visual Attention". in: M. I. Posner (ed.): *Foundations of Cognitive Science* . 631-682.

Bierwisch, Manfred/ Lang, Ewald (1989): *Dimensional Adjectives: Grammatical Structure and Conceptual Interpretation*. Berlin: Springer.

Carstensen, Kai-Uwe (1992): "Approaching the Semantics of Distance Expressions: Problems and Perspectives". In: Peter Bosch/ Peter Gerstl (Hrsg.), *Discourse and Lexical Meaning*, Workshop-Proceedings des SFB 340 "Sprachtheoretische Grundlagen für die Computerlinguistik", Bericht 30, 49-59.

Carstensen, Kai-Uwe (1994): "Die Rolle Fokussierter Aufmerksamkeit in Raumrepräsentation und Räumlicher Semantik: Aspekte einer Mentalen Interlingua". Paper presented at the 16. Annual Conference of the German Society of Linguistics.

Herskovits, Anette (1986): Language and Spatial Cognition. Cambridge: CUP.

Herweg, Michael (1989): "Ansätze zu einer semantischen Beschreibung topologischer Präpositionen". In: Christopher Habel, Michael Herweg, Klaus Rehkämper (eds.), *Raumkonzepte in Verstehensprozessen. Interdisziplinäre Beiträge zu Sprache und Raum*. Tübingen: Niemeyer. 99-127.

Herweg, Michael (1991): "Some Notes on *an* and *bei*".Internal Report.University of Hamburg.

Kahneman, Daniel/ Treisman, Anne (1992): "The Reviewing of Object Files: Object-Specific Integration of Information". *Cognitive Psychology* 24. 175-219.

Kuipers, B. J. (1982): "The 'Map in the Head' Metaphor". *Environment and Behaviour* 14 (2), 202-220.

Landau, Barbara/ Jackendoff, Ray (1993): "'What' and 'Where' in Spatial Language and Spatial Cognition". *Behavioral and Brain Sciences* 16. 217-265.

Lang, Ewald (1989): "The Semantics of Dimensional Designation of Spatial Objects". In: M. Bierwisch/ E. Lang (eds.).

Logan, Gordon (1994): "Linguistic and Conceptual Control of Visual Spatial Attention". *Cognitive Psychology*. in press.

McNamara, T. P. (1986): "Mental Representations of Spatial Relations". *Cognitive Psychology* 18, 87-121.

Miller, George A./ Johnson-Laird, P. N. (1976): *Language and Perception.* Cambridge, Mass.: Belknap Press.

Palmer, Stephen E. (1978): "Fundamental Aspects of Cognitive Representation". In: E. Rosch, B. Lloyd, *Categorization and Cognition.* 259-303.

Palmer, Stephen E. (1992): "Common Region: A New Principle of Perceptual Grouping". *Cognitive Psychology* 24. 436-447.

Palmer, Stephen E./ Rock, Irvin (1994): "Rethinking Perceptual Organization: The Role of Uniform Connectedness". *Psychonomic Bulletin & Review* 1 (1). 29-55.

Partee, Barbara/ ter Meulen, Alice/ Wall, Robert E. (1990): *Mathematical Methods in Linguistics.* Dordrecht: Kluwer Academic Publishers.

Pribbenow, Simone (1993): *Räumliche Konzepte in Wissens- und Sprachverarbeitung.* Wiesbaden: Deutscher Universitätsverlag.

Sperling, George/ Wurst, Stephen A./ Lu, Zhong-Lin (1992): "Using Repetition Detection to Define and Localize the Processes of Attention", in Meyer/ Kornblum (eds.), *Attention and Performance XIV.* Cambridge, Mass., MIT Press. 265-298.

Theeuwes, Jan (1993): "Visual Selective Attention: A Theoretical Analysis". *Acta Psychologica* 83. 93-154.

Treisman, Anne (1988): "Features and Objects: The Fourteenth Bartlett Memorial Lecture". *The Quarterly Journal of Experimental Psychology* 40 A (2). 201-237.

Ullman, Shimon (1984): "Visual Routines". *Cognition* 18, 97-160.

Verkuyl, Henk/ Zwarts, Joost (1992): "Time and Space in Conceptual and Logical Semantics: The Notion of Path". *Linguistics* 30. 483-511.

Werner, Heinz (1985): "Die Semantik der Täuschungen". *Linguistische Berichte* 100. 477-510.

Werner, Heinz (1989): "Review of Ray Jackendoff: *Semantics and Cognition*". *Linguistische Berichte* 120. 163-167.

Wunderlich, Dieter (1982): Sprache und Raum. *Studium Linguistik* 12, 1-19; 13, 37-59.

Wunderlich, Dieter / Herweg, Michael (1990): Lokale und Direktionale. In: A.v.Stechow, D. Wunderlich, Handbuch der Semantik.

Carstensen, Kai-Uwe (1995): "Semantic and Conceptual Aspects of Local Expressions: Critical Remarks on the 'State of the Art'". In: Manfred Bierwisch, Peter Bosch (Hrsg.), Semantic and Conceptual Knowledge, Workshop-Proceedings of the SFB 340 „Sprachtheoretische Grundlagen für die Computerlinguistik", Bericht Nr. 71, 117-126.