Priming Access to Entities in Spatial Mental Models

G. Bower, M. Rinck

Text comprehension requires that readers/listeners construct a mental model of the described situation in their visual-spatial working memory, and then manipulate and update elements of this model under guidance from the text. This paper describes how people's memory access to objects located within a known space (e.g., an office building) changes dynamically as they read narratives about characters moving around through that space. The "deictic center" or "here-and-now" point shifts as the narrator describes a series of events and movements involving story characters. Readers focus their attention internally upon the here-and-now point within their mental model, much like an internal spotlight shining onto a multi-room theater stage. Our experiments find that readers have quicker access to information about memorized objects that are in the current focus. This access speed (or "spatial priming") declines the farther the queried object is from the current focus and the longer the time elapsed since it was last in the focus. This priming arises for objects along an implied (but unmentioned) path of the character's movement and for objects in places that the character merely thinks about. In addition to speeding answering of location questions, these priming effects are reflected as well in shorter reading times for anaphoric phrases referring to objects at varying distances from the current focus. The distance effect is determined by categorical segments (number of intervening rooms) rather than by their metric size. Distance priming effects are similarly found for building layouts learned from texts and for layouts learned pre-experimentally (maps of the USA). This location distance gradient is related theoretically to goal relevance, that is, why the character goes to a particular place. Indeed, mention of a temporary goal for the character speeds access to objects relevant to that goal.

Key words: text comprehension, mental models, priming

Primingeffekte in Korrelation zum Aufmerksamkeitsfokus

Textverstehen erfordert, daß Leser im visuell-räumlichen Arbeitsgedächtnis ein mentales Modell der beschriebenen Situation bilden. Elemente dieses Modells müssen sodann in Abhängigkeit von der im Text gegebenen Information aktualisiert und manipuliert werden. In diesem Beitrag wird beschrieben, wie sich der Gedächtnisabruf von Objekten, die sich im mentalem Modell befinden, dynamisch verändert, wenn sich die Hauptperson einer Geschichte durch das mentale Modell bewegt. Leser fokussieren ihre Aufmerksamkeit dabei auf das "Hier und Jetzt" der Hauptperson. Die hier vorgestellten Experimente zeigen, daß Leser diejenigen 'Objekte schneller aus dem Gedächtnis abrufen können, die sich nahe am Fokus der Aufmerksamkeit befinden ("räumliches Priming", "Distanzeffekt"). Dieses Priming ist umso schwächer, je weiter das Objekt vom momentanen Aufmerksamkeitsfokus entfernt ist und je länger sein letzter Aufenthalt im Fokus zurückliegt. Das Priming tritt auch auf bei Objekten, die sich entlang eines implizierten Weges der Hauptperson befinden, und bei Objekten, an die die Hauptperson nur denkt. Das Priming zeigt sich in verkürzten Reaktionszeiten auf Fragen nach der Lokation der Objekte, aber auch in kürzeren Lesezeiten von Sätzen, die referentielle Verweise auf die Objekte enthalten. Der Distanzeffekt wird von der Anzahl der Räume zwischen Objekt und Aufmerksamkeitsfokus bestimmt, nicht von der Größe der Räume. Zudem treten Distanzeffekte sowohl bei experimentell gelernten Szenarios (fiktive Gebäude) als auch bei bekannten Räumlichkeiten (Karte der USA) auf. Der räumliche Distanzeffekt weist einen theoretischen Bezug zum Konzept der Zielrelevanz auf. Objekte, die für die Erreichung eines Ziels wichtig sind, zeigen ebenfalls einen Priming-Effekt.

Schlüsselwörter: Textverstehen, mentale Modelle, Priming

Cognitive psychology is advancing on a number of fronts, one of which is in understanding text comprehension and discourse. The consensus view is that several different processes go on in parallel as people read a text or listen to somebody telling them about events. According to many theories of text comprehension, readers build multi-level representations during the comprehension process (e.g., Gernsbacher, 1990; Johnson-Laird, 1983; Kintsch, 1988; van Dijk & Kintsch, 1983; Zwaan, Langston, & Graesser, 1995). First readers take in the *surface structure* of what's on the page, second, they extract a propositional *text base* which contains the logical relations between the concepts and the predicates and the arguments being made. Third, they construct a referential representation, a *mental model* or a *situational model*, which is what the text is about.

A mental model is constructed by connecting the concepts that are in the text to the real world or imaginary world referents. For instance, readers may create imaginary characters like Robin Hood or cowboy western heroes when they read about them in novels. As another example, when a newspaper article mentions Gerhard Schröder, readers will know that the article is referring to the man himself. The referential model can be used for integrating information about co-referring expressions. Thus, if the news article goes on to describe actions of the new chancellor of the German republic, readers understand that the expressions "new chancellor of the German republic" and "Gerhard Schröder" are referring to the same person. In addition, the mental model sets the parameters of space and time that are going to pervade the activities during the whole story. The model is used for deriving inferences, for interpreting the text, for filling out what the whole text is describing, for evaluating statements, as well as for updating the story. The mental model of a text is also largely what people remember about it. They remember not what the author wrote or said, but what he or she talked about - the gist of the story.

A narrative text has three main components: First is the physical situation in which the story takes place. Second is the cast of characters. Third is a series of episodes in which those characters are performing actions. The characters have a set of goals and problems that are associated with their occupations or their roles in the story. These goals motivate a series of actions that constitute the episodes which are the main part of a story. As readers read and understand a story, they extract from it the actions, plans, and goals of the main characters. Readers then explain the actions by constructing a causal network of story parts reflecting how one action enabled another action or some action was carried out in order to produce a particular outcome. The causal network is important in determining people's judgements about what is important in a story, what is salient, what will be remembered, how the story should be summarized, and so on. The causal network of a text also determines the gist of the text that a person will extract. Considerable research has investigated causal networks and their role in narrative memory; for an overview see van den Broek (1994).

In this talk we will concentrate on mental models of the physical situation in which a story takes place. This model includes the spatial layout of objects described in the story. I will talk about how people use their spatial situational model. Situational models can be studied in several ways. One approach studies how people construct a model online as they read or hear it line by line. Another approach examines what readers do with the model once they have constructed it. This is the approach we followed in the experiments to be described.

In these experiments, people first memorized a map of a building before they read some stories about events taking place within that building. We were interested primarily in what is called the *updating* process, wherein readers modify the characters' location information as they read about them moving about. We were especially interested in the consequences of having the reader focus attention on specific characters and places within the mental model. One focus of attention is the main character or protagonist of the story. Narrators tell a story from the perspective of the main character. The protagonist's goals are given priority, readers view events from the protagonist's perspective, and they focus on the protagonist and his or her physical location. We think of this process of focusing in situation models as analogous to that of a spotlight shining into a doll house. The model might be thought of as an inner stage or a doll house that readers construct in their head. Thus, the reader's focus of attention is like a spotlight that he or she shines onto a character or a place in that doll house. This focus idea is similar to linguists' notions of *foregrounding*. The experiments described here were carried out to investigate some of the psychological consequences of this focus.

The first experiments by Dan Morrow (1985) were concerned with a process called anaphor resolution. Foregrounding of concepts brings them into working memory, so they are easily available when one has to understand what a pronoun

refers to. Focus in language is used to resolve the referent of pronominal forms as occur in "*John broke the window. It cut him*". We know that the *him* refers to John, and the *it* to the broken glass of the window-because these elements are in the foreground. The operation effect of focus can more clearly be seen in ambiguous expressions such as "*John walked past the car up the road into the house. The windows were dirty.*" What windows are being talked about? Morrow (1985) carried out a number of experiments in which people invariably used a principle of proximity to the protagonist to resolve what object is being referred to. Thus, if the protagonist is now at the house and we say "*The windows were dirty*", readers take that to be the windows of the house. If the text instead said something like "*John was walking past the car towards the house. The windows were dirty,*" the windows would be those of the car. People use this principle of proximity to resolve ambiguous referring expressions by saying "What's nearer to the current focus of attention?" which in this case is near to where the protagonist is at the moment.

The proximity principle predicts easier memory access to things that are near the focus of attention. We have tested this prediction in several experiments in which we examined access to information about things that are varying distances from a focus point. The earlier experiments were conducted in collaboration with Daniel Morrow (Morrow, Bower, & Greenspan, 1989; Morrow, Greenspan, & Bower, 1987). The procedure involved teaching participants a spatial layout of a building and then having them read a story about somebody moving around in that space. Supposedly, while reading the story, readers would focus on the main character as he or she moves around. We predicted that as the protagonist moved from one location into another, objects at that new location would be in the focus, would become more available in memory, so that questions about these objects could be answered quickly. We expected a spatial gradient or distance effect in this availability, i.e., the closer an object is to the focus of attention, the more available it should be. We also predicted a temporal delay effect, i.e., recently activated objects and places should retain some activation but a dwindling amount as time passes and the focus moves on to other places and entities.

As indicated, to investigate these effects, we taught people the layouts of two buildings, namely, a warehouse and a research center. Figure 1 shows the layout of the research center used in Experiment 1 of Morrow et al. (1987). Each building had four rooms with four objects in each room. After memorizing the layout of the two buildings, participants read stories line by line from a computer screen describing characters moving around through these buildings. The setting for half the stories was the research center and for the other half was the warehouse. Our focus hypothesis leads us to be particularly interested in cognitive processes surrounding sentences describing motions such as "*Wilbur walked from the library into the reception room.*" These are the sentences that allegedly move the focus from one room to another (see Figure 1). After reading a motion sentence like this one, the availability of different objects and concepts in the situation model was assessed by interrupting the reading task and asking participants whether two objects were located in the same room. Half the time the two objects were in the same room (yielding a "Yes" answer) and half the time they were not. On some trials we varied

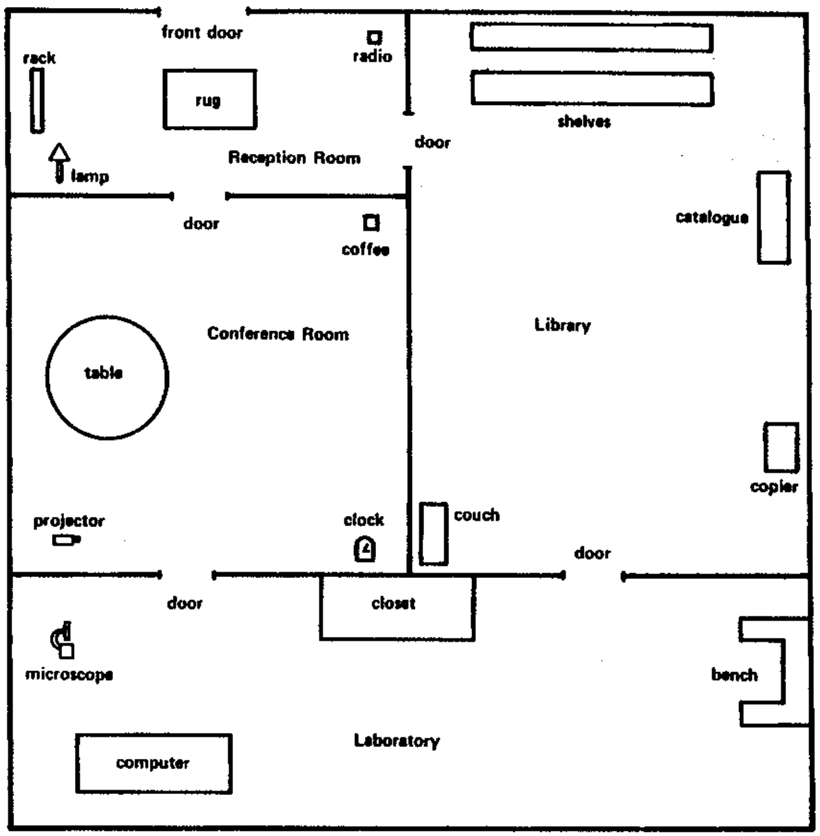

Fig. 1: Sample layout from Morrow, D. C., Greenspan, S. L., & Bower, G. H. (1987). Accessibility and situation models in narrative comprehension. Journal of Memory and Language, 26, 165-187. Copyright: Academic Press.

the distance from the focus to the two objects in the probe. The two objects could be in the room into which the protagonist just moved (e.g., the lamp and the rug in the reception room in Figure 1), in the room he just left (e.g., the shelves and the couch in the library), some other room in this building (e.g., the projector and the clock in the conference room), or in a room in another building which was not being talked about in this story (e.g., the bench and the bed in the warehouse). The focus hypothesis predicts that people should be very quick answering questions about objects in the room where the focus is (the "location room"), a little slower about objects in the room from which the protagonist started his movement a few seconds ago (the "source room"), slower still for objects in other rooms of the current building, and slowest for objects in the other building. This is exactly the pattern of reaction times we observed in these experiments. An orderly gradation of access time in memory was found, indicating the existence of both a spatial-distance effect and a time-delay effect.

One might object that higher accessibility of objects in the location room compared to objects in the source room is due to recency of mention rather than spatial distance in the situation model. After all, in motion sentences of the type "*The protagonist went from the source room into the location room,*" the location room is mentioned more recently (closer to the probe test) than the source room. However, the same pattern of results was observed when the order of mention was reversed using motion sentences such as "*The protagonist went into the location room from the source room*" (Morrow et al., 1987, Exp. 2). In fact, the spatial gradient of accessibility appears even if the location room is not mentioned at all. In one experiment, similar distance effects were observed when access was probed after motion sentences such as "*Then he walked into the next room*" (Rinck & Bower, 1995). So not even mentioning the location room, just implying it in the situation model yielded exactly the same differences in accessibility.

Glenberg, Meyer, and Lindem (1987) have shown a similar distance effect by locating a movable object spatially close to the main character of a story, e.g. if the main character puts a flower in his coat and goes walking off and our attention follows him. That flower will remain in the focus and easily accessible, since readers keep their attention on the protagonist as he moves away. On the other hand, if he discards the flower and walks away from it, the flower will be out of focus, it will not receive much activation, and references to it will be processed more slowly.

How might we explain such distance effects in theory? A simple way to think about it is the spotlight metaphor with elements in or near the spotlight being "seen" and read out more quickly. Another explanation uses spreading activation in an associative network such as the one depicted in Figure 2 (e.g., Anderson & Bower, 1973). The relevant information might be represented in long-term memory as a hierarchically-organized network that encodes the spatial layout a participant has just memorized. As the person is reading, he or she is adding pieces of text such as "*Wilbur walked from the library into the reception room*" to the information contained in working memory. Such sentences activate concepts like the *library* and the *reception room* (see Figure 2). In addition, certain automatic inferences are drawn such as "*Wilbur is now located in the reception room.*" This inference will cause more activation to be placed on the reception room - which is where Wilbur is now - then is left on the library. With appropriate adjustments of parameters, this network theory can explain our results very well. I think that this network model may be a perfect dual to the spotlight theory. Haenggi, Kintsch, and Gernsbacher (1995) suggested a model which is similar to the one just described.

The basic experimental paradigm is well suited for investigating several questions regarding the updating of situation models during text comprehension. For these experiments, we used a rather larger building layout, like that shown in Figure 3, which affords many more testing conditions.

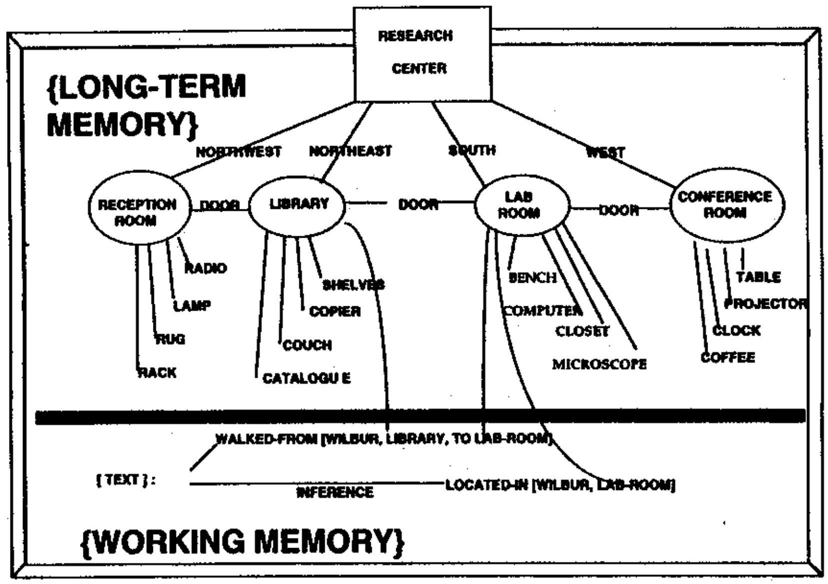

Fig. 2: An associative network that encodes knowledge of the building's spatial layout in long-term memory. Nodes denote rooms and objects, and links denote spatial relationships and connections. Working memory (lower part) contains the currently active sentence and a spatial inference from it (the Here-Now location).

One question is whether people activate intermediate points along a path as their focus goes from a starting point to the ending point of a movement. To answer this, we had subjects memorize this large building and then read sentences which implied movements of the protagonist along a path, from a starting room through an intermediate ("path") room into an ending ("goal") room. The sentence did not actually mention the path room, only the start and goal room. After reading the motion sentence, accessibility was tested for objects in the starting room, the path room, the goal room, or some other room in the building.

What results might we expect here? If activation of places depends solely on explicit mentioning of their names, the source room and the location room should be highly activated, but the path room should not. If, on the other hand, readers represent in imagination the protagonist's motion from the source room through the path room into the location room, then the path room should be activated to an intermediate degree. If activation depends on spatial distance more than on explicit mentioning, the path room should receive higher activation than the source room. The reaction times revealed a spatial gradient of accessibility: retrieval of location room objects was faster than retrieval of path room objects which in turn were faster than retrieval of source room objects. So it appears as if readers imagine the protagonist moving along a path, leaving behind a fading trail of activation. This is a robust finding that we have replicated in a number of studies (Morrow et al., 1989; Rinck, Williams, Bower, Becker, 1996; Wilson, Rinck, McNamara, Bower, Morrow, 1993).

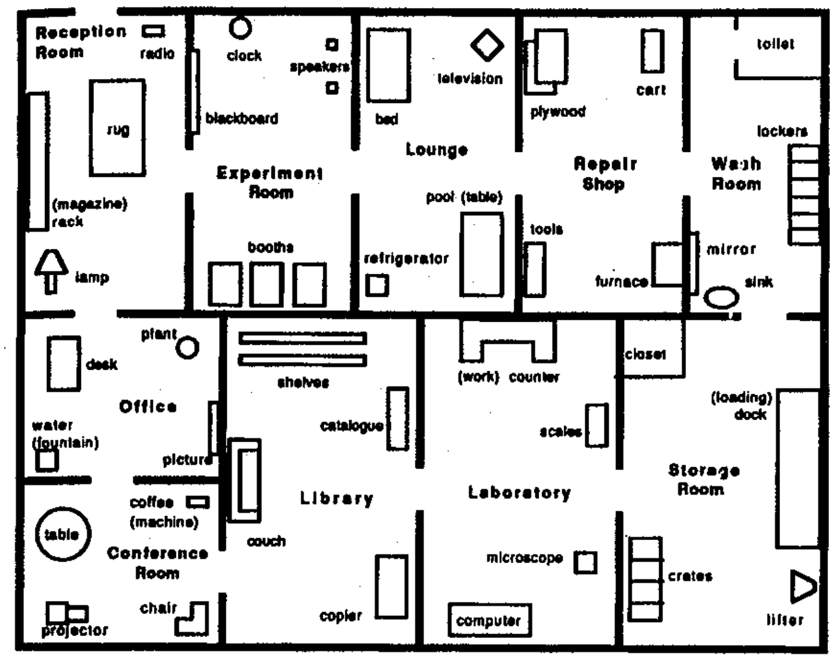

Fig. 3: Sample layout from Rinck, M., & Bower, G. H. (1995). Anaphora resolution and the focus of attention in situation models. Journal of Memory and Language, 34, 110-131. Copyright: Academic Press.

A second question asks what is more important in determining the focus of attention - the physical location of the main character or his mental location? Where the protagonist is actually located or where he is thinking about? To answer this question, we had participants read stories containing sentences of the type "*The protagonist was in Room A thinking about [doing something] in Room B*" (Morrow et al., 1989). The "something being done" mentioned only neutral topics (e.g., cleaning the floor, painting the walls) and never mentioned a specific object memorized in that room. Following such a sentence, we probed for how activated objects are in Room A and in Room B. We found that participants were faster to retrieve information about objects in the room where the protagonist's mental focus was (Room B) than in the room where he was physically located (Room A). This indicates that focus moves to what the main character is thinking about; this is, readers are in some sense simulating his or her thoughts.

One could object to this class of experiments because they all involve interrupting participants as they read a story and asking them about the current locations of the protagonist and various objects. Such tasks might make readers concentrate unduly on the locations of things. So we devised a technique that is unobtrusive and consists solely of having participants read the text at their own rate. With this technique, we have people first learn a spatial layout, and then read narratives containing motion sentences such as "*Then Carl walked from the library into the storage room*" (see Figure 2). At that point, we insert a "think about" sentence in the text, such as: "*He thought about all the things he had to clean up for the directors. He thought he would clean up the closet in the storage room.*" We measure the time to read the final phrase that refers to a critical object, the closet. This object could be located either in the location room, the path room, the source room, or in some other room of the building.

Surprisingly, we have repeatedly found a robust spatial gradient in such reading times: reading is faster if the sentence refers to an object in the location room, next fastest for an object in the path room, next fastest for an object in the source room, and slowest for referring to an object in some other room in the building (Rinck & Bower, 1995; Rinck, Bower, & Wolf, 1998; Rinck, Hähnel, Bower, & Glowalla, 1997; Rinck et al., 1996).

One might ask how "distance" is to be measured in this effect. Is it metric, Euclidean distance as a crow-flies, or is it categorical distance based on the number of rooms? For a given distance, is an object's accessibility determined more by the size of the rooms or by the number of divisions of a given distance into discrete rooms between an object and the focus of attention? The earlier experiments always confounded categorical and metric distance. But maps can be constructed in which these types of distance are unconfounded (Rinck et al., 1997). These maps contained paths leading through single path rooms that were either short or long, and paths through two path rooms that were either short or long. In this way, Euclidean distance (size of the path rooms) and categorical distance (number of path rooms) of different paths were varied orthogonally in the map. As before, after memorizing the map, participants read stories containing motion sentences implying that the protagonist walked through a path room (or rooms) of one of these four kinds.

A first surprising finding was that reading time for a motion sentence was longer when the implied path led through two rooms compared to one room. The size of the intermediate room (or rooms), i.e., Euclidean distance traveled by the protagonist, had no effect on reading times at all.

After each motion sentence, people read an anaphoric sentence that referred to an object in the part of the path room that was near or far from the protagonist. As noted, categorical distance between the protagonist and the object referred to was either one or two rooms, and the Euclidean distance was either short or long. Reading times of these anaphoric sentences yielded another surprising finding. Metric distance between the object referred to and the protagonist had no effect whatsoever on anaphor reading times. Rather, reading times varied solely with categorical distance: References to an object that was one room away from the protagonist were understood more readily than references to an object that was two rooms away regardless of the Euclidean distances involved. Thus, reading and anaphor look-up times are determined by categorical segments of space (i.e., rooms), not Euclidean metric distance. Paradoxically, in this situation people have in memory all the knowledge about metric information necessary to draw (after the experiment) a correctly scaled map of the building. However, they seem not to use this metric knowledge during reading.

Another objection that is often raised regarding these experiments is that the results may be due to the rather artificial map learning procedure. People usually learn about spatial environments by experiencing them directly rather than by memorizing a map. The objection is unjustified, however. We have observed the same distance effects after people learned about the relevant spatial information from studying a text describing the building (Rinck et al., 1996). These distance effects also arose when the texts and questions referred to a well-known spatial environment that people did not have to memorize at all. In an unpublished study by Saskia Traill and Gordon Bower, participants read stories about salesmen who traveled to various cities around the United States of America. For instance, a sentence in one story described how the main character drove his car from Miami to New York City. Following such motion sentences participants read anaphoric sentences designed to measure the accessibility (via reading time) of the source city (Miami), the location city (New York), or an unmentioned intermediate path city (Baltimore). As before, a spatial gradient of accessibility occurred in reading times, indicating that the location city was more available than the path city which in turn was more available than the source city.

Finally, we may ask why these spatial priming results arise at all. Our current hypothesis is that spatial distance effects are at least partially related to priming by inferred or stated goals of the protagonist. When the main character moves near objects, why should those become more accessible than distant objects? Our suggestion is people go to locations in order to do something that will satisfy some goal, often by using objects located there. For example, you go to the laundry room to do the laundry, you go to the bathroom to use the toilet, or you go to the kitchen to get some food. In these locations, typical objects will be used to satisfy the goals, e.g., the washer, the toilet, and the refrigerator, respectively. In short, people do not wander around aimlessly, they go places to satisfy goals using objects. This is as true for characters in stories as it is for real people.

To gather some supporting evidence, we conducted an experiment in collaboration with Erin Graves (described in Bower & Rinck, in press), in which the goal relevance in the story of probed objects was varied independently of their spatial proximity to the protagonist of the text. After a motion sentence, the critical object probed was either in the source room or in the location room, and it was either relevant or irrelevant to the protagonist's temporary goal. When accessibility of these objects was probed, we found that both goal relevance and spatial distance affected accessibility additively: relevant objects close to the focus were most accessible, whereas irrelevant objects far from the focus were least accessible.

To summarize, this paper has described how we have investigated the consequences of shifting the focus of attention in mental models. Readers use the proximity principle to resolve ambiguous referential expressions; access to information about objects close to the focus is particularly fast; this spatial priming effect follows a distance gradient; intermediate priming occurs on objects and places along the path of the protagonist; the focus moves to where the protagonist's thoughts are, not where he or she is located at the moment; objects that are physically carried along with the protagonist - like a flower in the buttonhole - are in the focus of attention; distance effects are categorical rather than Euclidean; distance effects occur in anaphor resolution time as well as in probe reaction time; distance effects can be observed after learning of fictitious environments from texts as well as maps, and as well with familiar natural environments; and finally, the accessibility of objects is affected both by their spatial proximity and their goal relevance. We believe, we have made a substantial beginning in our efforts to investigate consequences for memory retrieval of readers shifting their focus of attention.

References

Anderson, J. R. & Bower, G. H. (1973). *Human associative memory*. New York: Winston.

Bower, G. H. & Rinck, M. (in press). Goals as generators of activation in narrative understanding. In S. R. Goldman, A. C. Graesser & P. van den Broek (Eds.). *Narrative comprehension, causality, and coherence: Essays in honor of Tom Trabasso*. Mahwah, NJ: Erlbaum.

Gernsbacher, M. A. (1990). *Language comprehension as structure building*. Hillsdale, NJ: Erlbaum.

Glenberg, A. M., Meyer, M. & Lindem, K. (1987). Mental models contribute to foregrounding during text comprehension. *Journal of Memory and Language, 26*, 69-83.

Haenggi, D., Kintsch, W., Gernsbacher, M. A. (1995). Spatial situation models and text comprehension. *Discourse Processes, 19*, 173-199.

Johnson-Laird, P. N. (1983). *Mental models*. Cambridge, Great Britain: Cambridge University Press.

Kintsch, W. (1988). The role of knowledge in discourse comprehension: A construction-integration model. *Psychological Review, 95*, 163-182.

Morrow, D. G. (1985). Prepositions and verb aspect in narrative understanding. *Journal of Memory and Language, 24*, 390-404.

Morrow, D. G., Bower, G. H. & Greenspan, S. L. (1989). Updating situation models during narrative comprehension. *Journal of Memory and Language, 28*, 292-312.

Morrow, D. G., Greenspan, S. L. & Bower, G. H. (1987). Accessibility and situation models in narrative comprehension. *Journal of Memory and Language, 26*, 165-187.

Rinck, M. & Bower, G. H. (1995). Anaphora resolution and the focus of attention in situation models. *Journal of Memory and Language, 34*, 110-131.

Rinck, M., Bower, G. H. & Wolf, K. (1998). Distance effects in surface structures and situation models. *Scientific Studies of Reading, 2*, 221-246.

Rinck, M., Hähnel, A., Bower, G. H. & Glowalla, U. (1997). The metrics of spatial situation models. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 23*, 622-637.

Rinck, M., Williams, P., Bower, G. H. & Becker, E. S. (1996). Spatial situation models and narrative understanding: Some generalizations and extensions. *Discourse Processes, 21*, 23-55.

van den Broek, P. (1994). Comprehension and memory of narrative text: Inferences and coherence. In M. A. Gernsbacher (Ed.). *Handbook of psycholinguistics* (pp. 539-588). San Diego, CA: Academic Press.

van Dijk, T. A. & Kintsch, W. (1983). *Strategies of discourse comprehension*. New York: Academic Press.

Wilson, S. G., Rinck, M., McNamara, T. P., Bower, G. H. & Morrow, D. G. (1993). Mental models and narrative comprehension: Some qualifications. *Journal of Memory and Language, 32*, 141-154.

Zwaan, R. A., Langston, M. C. & Graesser, A. C. (1995). The construction of situation models in narrative comprehension: An event-indexing model. *Psychological Science, 6*, 292-297.

Preparation of this paper was supported by a grant from the German Research Foundation (DFG) to Mike Rinck, and by a NIMH Grant (MH-47575) to Gordon Bower. We would like to thank Karin Wolf for her help in preparing this manuscript.
Correspondence should be addressed to Gordon H. Bower, Stanford University, Dept. of Psychology, Jordan Hall, Bldg. 420, Stanford, CA 94305-2130, USA, or by electronic mail to gordon@psych.stanford.edu.

CIP-Titelaufnahme der Deutschen Bibliothek

Schwerpunktthema "Zukunft gestalten" / im Auftr. der Deutschen Gesellschaft für Psychologie hrsg. von W. Hacker und M. Rinck. - Lengerich ; Berlin ; Düsseldorf ; Leipzig ; Riga ; Scottsdale (USA) ; Wien ; Zagreb : Pabst Science Publishers, 1999
(Bericht über den ... Kongreß der Deutschen Gesellschaft für Psychologie ... ; 41)
ISBN 3-933151-90-2

Konvertierung: Claudia Döring
Lektorat: Erika Wiedenmann

ISBN 3-933151-90-2