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The research investigated language comprehension, and in particular, the general, cognitive processes and mechanisms that underlie language comprehension. These general, processes and mechanisms were investigated using a simple framework Gernsbacher (1990) refers to as the structure Building Framework. According to the Structure Building Framework, the goal of comprehension is to build a coherent, mental representation or "structure". To do this, comprehenders must first lay a foundation. Next, they develop the structure by mapping on information when that incoming information is coherent or related to previous information. However, if the incoming information is coherent or related to previous information. However, if the incoming information is less coherent or related, comprehenders shift to initiate a new substructure. Thus, most representations comprise several branching substructures. These structure building processes are accomplished by two mechanisms: enhancement, which boosts the activation of some representations, and suppression, which dampens the activation of other representations.

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Final Tech Report 89-0258

LANGUAGE COMPREHENSION AS STRUCTURE BUILDING

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I. OVERALL SUMMARY OF RESEARCH SUPPORTED BY AFOSR 89-0258

The research supported by AFOSR 89-0258 investigated **language comprehension**, and in particular, the general, **cognitive processes** and mechanisms that underlie language comprehension. These general, processes and mechanisms were investigated using a simple framework Gernsbacher (1990) refers to as the **Structure Building Framework**. According to the Structure Building Framework, the goal of comprehension is to build a coherent, **mental representation** or "structure". To do this, comprehenders must first lay a foundation. Next, they develop the structure by mapping on information when that incoming information is coherent or related to previous information. However, if the incoming information is less coherent or related, comprehenders shift to initiate a new substructure. Thus, most representations comprise several branching substructures. These structure building processes are accomplished by two mechanisms: **enhancement**, which boosts the **activation** of some representations, and **suppression**, which dampens the activation of other representations.

II. OBJECTIVES AND ACCOMPLISHMENTS SUPPORTED BY AFOSR 89-0258

Language can be viewed as a specialized skill involving language-specific processes and language-specific mechanisms. Another position views language comprehension and production as drawing on general, cognitive processes and mechanisms. Such processes and mechanisms also underlie nonlinguistic tasks. I have adopted the view that many of the processes and mechanisms involved in language comprehension are general cognitive processes and mechanisms. The goal of my recent research has been to identify and explore these cognitive processes and mechanisms. I have done this using a simple framework as a guide. I call this framework the Structure Building Framework, and I describe it in my book, *Language Comprehension as Structure Building* (Erlbaum, 1990).

According to the Structure Building Framework, the goal of comprehension is to build a coherent, mental representation or "structure" of the information being comprehended. Building this mental structure involves several component processes. First, comprehenders lay foundations for their mental structures. Next, comprehenders develop their structures by mapping on information when that incoming information coheres or relates to previous information. But when the incoming information is less coherent or related, comprehenders employ a different process: They shift to initiate a new substructure. So, most representations comprise several branching substructures.

The building blocks of these mental structures are memory nodes. Memory nodes are activated by incoming stimuli. Initial activation forms the foundation of mental structures. Once the foundation is laid, subsequent information is often mapped on to a developing structure because the more the incoming information coheres with the previous information, the more likely it is to activate the same or connected memory nodes. In contrast, the less coherent the incoming information is, the less likely it is to activate the same or connected memory nodes. In this case, the incoming information might activate a different set of nodes, and the activation of this other set of nodes might form the foundation for a new substructure.

Once memory nodes are activated, they transmit processing signals. These processing signals either enhance (boost) or suppress (dampen) other nodes' activation and thereby control the structure building processes. Presumably memory nodes are enhanced because the information they represent is necessary for further structure building. They are suppressed when the information they represent is no longer as necessary.

My students and I have investigated the three subprocesses involved in structure building, namely, laying a foundation, mapping relevant information onto that foundation, and shifting to initiate a new substructure. We have discovered that these processes account for many language comprehension phenomena.

For example, in Gernsbacher and Hargreaves (1988; *Journal of Memory and Language*, 27, 699-717), we demonstrated that the process of laying a foundation and mapping information onto that foundation accounts for a phenomenon we called The Advantage of First Mention. The advantage is this: Participants mentioned first in a sentence are more memorable than participants mentioned later. Through laboratory experiments we discovered that the Advantage of First Mention is not due to first-mentioned participants' tendency to be semantic agents; neither is the advantage due to the first-mentioned participants being literally the first words of their stimulus sentences (and possibly artificially highlighted by the warning signal that preceded each experimental trial). The advantage maintains even when both the first- and second-mentioned participants are syntactic subjects, and even when the first-mentioned participants are not the syntactic subjects. We suggest that the Advantage of First Mention arises because comprehension requires laying a foundation and mapping subsequent information onto that foundation. First-mentioned participants are more accessible because they form the foundations for their sentence-level representations and because it is through them that subsequent information is mapped onto the developing representations.

In Gernsbacher and Hargreaves (1991; *Typological Studies in Language*), we reviewed numerous languages whose preferred word order is both more and less constrained than English word order. Despite the greater or lesser constraints in these languages, first mentioned participants play a specific functional role. That is, speakers and writers specifically choose among the grammatical structures provided by their language so that they can purposely mention certain participants first.

In Gernsbacher, Hargreaves, and Beeman (1989; *Journal of Memory and Language*, 28, 735-755), we demonstrated how the processes of laying a foundation and shifting can account for another phenomenon, what we called The Advantage of Clause Recency. The Advantage of Clause Recency means that information in the most recently mentioned clause is more memorable than information from an earlier clause. The Advantage of Clause Recency obviously conflicts with the Advantage of First Mention. In a series of experiments, we resolved this conflict and discovered how comprehenders build mental representations of clauses. We found evidence to support the assumptions that comprehenders represent each clause of a two-clause sentence in its own mental substructure and that comprehenders have greatest access to information in the substructure that they are currently developing, that is, they have greatest access to information in the most recent clause (hence, the Advantage of Clause Recency). However, at some point, the first clause becomes more accessible because the substructure representing the first clause of a two-clause sentence serves as a foundation for the whole sentence-level representation (hence, the Advantage of First Mention).

In Gernsbacher (1985; *Cognitive Psychology*, 17, 324-363), I discovered that the cognitive process of shifting can explain why comprehenders rapidly forget recently comprehended information (in particular, information that is typically considered "superficial" or "surface" information). These experiments demonstrated that comprehenders rapidly forget recently comprehended information when they are comprehending nonverbal picture stories; so, the phenomenon is not unique to language. Furthermore, this rapid forgetting is most likely to occur when comprehenders encounter a structural boundary, for instance, when they encounter a new clause, a new sentence, or — as in my picture story experiments — a new episode. Because the phenomenon occurs with nonverbal picture stories, it is probably not due to the traditional psycholinguistics explanation. Because the structure of the information, rather than the amount, affects comprehenders' memory, the phenomenon is probably not due to the limitations of a short-term memory. I empirically demonstrated that the phenomenon is not due to another popular explanation: Comprehenders lose access to information — in particular verbatim information, because it is recoded into "gist." Rather, comprehenders rapidly forget information because comprehension involves shifting. Once comprehenders have shifted to initiate a new substructure, it is difficult to access information represented in a previous substructure. Surface information is least likely to remain accessible because it is least likely to be represented in multiple substructures.

According to the Structure Building Framework, mental structures are built of memory nodes; once activated, two cognitive mechanisms control memory nodes' activation levels: suppression and enhancement. My students and I have also investigated these two mechanisms and identified many of the roles they play in comprehension.

For example, in Gernsbacher and Faust (1990; chapter in *Comprehending word and sentence*) we demonstrated the role that suppression plays in how comprehenders understand the meanings of words in discourse. When comprehenders encounter ambiguous words (such as *spade*), multiple meanings are often immediately activated, even though one meaning is clearly implied by the context (as in *He dug in the garden with the spade*). However, within a half second, only contextually appropriate meanings remain activated. What happens to the contextually inappropriate meanings? We discovered that contextually inappropriate meanings do not become less activated through a mechanism we dubbed mutual inhibition (i.e., the contextually inappropriate meanings do not decrease in activation simply because the contextually appropriate meanings increase, as in a see-saw

effect). We discovered that contextually inappropriate meanings do not become less activated simply because they decay. Rather, inappropriate meanings become less activated through an active dampening of activation; they are suppressed by signals transmitted by memory nodes representing the semantic, pragmatic, and syntactic context.

In Gernsbacher (1989; *Cognition*, 32, 99-156), I discovered the role that both suppression and enhancement play in how comprehenders understand anaphoric devices. Anaphoric devices, such as pronouns or repeated nouns, refer to previously mentioned concepts called antecedents. The more explicit the anaphors, the more likely they are to trigger the mechanisms of suppression and enhancement. Very explicit anaphors, such as repeated names, immediately enhance the activation of their antecedents and suppress the activation of other concepts. Through enhancement and suppression, the anaphor's antecedent becomes the most activated concept. Less explicit anaphors, such as pronouns, also make their antecedents more accessible through the mechanism of suppression; however, less explicit anaphors take longer to trigger suppression, and they trigger suppression less powerfully.

In Gernsbacher and Shroyer (1989; *Memory & Cognition*, 17, 536-540), we discovered cataphoric devices. Just as anaphoric devices mark concepts that have been mentioned before, cataphoric devices mark concepts that are likely to be mentioned again. For example, two cataphoric devices are spoken stress and the indefinite article *this* ("I know *this* guy who ..."). In Gernsbacher and Jescheniak (accepted pending revisions in *Cognitive Psychology*), we discovered how cataphoric devices make their concepts more accessible: Concepts marked by cataphoric devices are activated at a higher level (they are enhanced); concepts marked by cataphoric devices are better at suppressing the activation of other concepts; and concepts marked by cataphoric devices better resist being suppressed by other concepts.

According to the Structure Building Framework, many of the cognitive processes and mechanisms underlying language comprehension are general cognitive processes and mechanisms; therefore, some of the bases of individual differences in comprehension skill might not be language-specific. My students and I have investigated this prediction and found substantial support for it.

For example, in Gernsbacher, Varner, and Faust (1990; *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 16, 430-445), we discovered that skill at comprehending linguistic media (written and auditory stories) is highly correlated with skill at comprehending nonlinguistic media (picture stories). In a second experiment, we discovered that less-skilled comprehenders lose access to recently comprehended information more rapidly than more-skilled comprehenders do, and this difference occurs regardless of whether they are comprehending written, auditory, or picture stories. According to the Structure Building Framework, all comprehenders lose access to recently comprehended information when they shift from actively building one substructure and initiate another. So, less-skilled comprehenders might be worse at remembering recently comprehended information because they shift too often. In our third experiment, we found evidence to support this hypothesis. In our last experiment we discovered why a greater tendency toward shifting might characterize less-skilled comprehenders: less-skilled comprehenders are less able to suppress inappropriate information, such as the contextually inappropriate meaning of an ambiguous word (e.g., the playing card meaning of *spade* in the sentence *He dug in the garden with the spade*). Because inappropriate information cannot be easily mapped onto an existing substructure, its activation could trigger the development of a new substructure.

In Gernsbacher and Faust (1991, *Journal of Experimental Psychology: Learning, Memory & Cognition*, 17, 245-262), we investigated whether less-skilled comprehenders are less able to suppress contextually inappropriate meanings because they have less-efficient suppression mechanisms. We discovered that less-skilled comprehenders are also less able to suppress the incorrect forms of homophones (e.g., the word *rose* when they read *rows*), and they are less able to suppress the typical-but-absent members of scenes

(e.g., a picture of a *tractor* in a farm scene). We also discovered that less-skilled comprehenders are less able to ignore words superimposed on pictures and pictures surrounding words. But less-skilled comprehenders are not less appreciative of context; in fact, they activate contextually-appropriate information more strongly than more-skilled comprehenders do. So, less-skilled comprehenders' suppression mechanisms, not their enhancement mechanisms, are less efficient.

Currently, I am collaborating with Villa-Good to investigate whether less-skilled comprehenders are also less-skilled at the process of mapping. Another graduate student, Matthew Traxler, and I are using the Structure Building Framework to explore the mental processes involved in written composition, as illustrated in our recent paper (in press, *Language and Cognitive Processes*).

III. PUBLICATIONS RESULTING FROM AFOSR 89-0258

Books

- GERNSBACHER, M.A. (1990). *Language comprehension as structure building*. Hillsdale, NJ: Erlbaum.
- GERNSBACHER, M.A. (Ed.), (in preparation). *Handbook of psycholinguistics*. San Diego, CA: Academic Press.
- GERNSBACHER, M.A. (in preparation). *Fundamentals of psycholinguistics*. Hillsdale, NJ: Erlbaum.

Articles and Chapters

- GERNSBACHER, M.A. (1989). Mechanisms that improve referential access. *Cognition*, 32, 99-156.
- GERNSBACHER, M.A., & SHROYER, S. (1989). The cataphoric use of the indefinite this in spoken narratives. *Memory & Cognition*, 17, 536-540.
- GERNSBACHER, M.A., HARGREAVES, D., & BEEMAN, M. (1989). Building and accessing clausal representations: The advantage of first mention versus the advantage of clause recency. *Journal of Memory and Language*, 28, 735-755.
- GERNSBACHER, M.A., VARNER, K.R., & FAUST, M. (1990). Investigating differences in general comprehension skill. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 16, 430-445.
- HARGREAVES, D., & GERNSBACHER, M.A. (1990). Review of S.N. Sridhar's, "Cognition and Sentence Production." *American Journal of Psychology*, 103, 418-424.
- GERNSBACHER, M.A., & FAUST, M. (1990). The role of suppression in sentence comprehension. In G.B. Simpson (Ed.), *Comprehending word and sentence* (pp. 97-128). Amsterdam: North Holland.
- GERNSBACHER, M.A. (1991). Cognitive processes and mechanisms in language comprehension: The structure building framework. In G.H. Bower (Ed.), *The psychology of learning and motivation*. New York: Academic Press.
- GERNSBACHER, M.A., & FAUST, M. (1991). The mechanism of suppression: A component of general comprehension skill. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 17, 245-262.
- GERNSBACHER, M.A. (1991). Comprehending conceptual anaphors. *Language and Cognitive Processes*, 6, 81-105.
- GERNSBACHER, M.A., & HARGREAVES, D. (in press). The privilege of primacy: Experimental data and cognitive explanations. *Typological Studies in Language*.
- GERNSBACHER, M.A., GOLDSMITH, H.H., & ROBERTSON, R.W.R. (in press). Do readers represent characters' emotional states? *Cognition & Emotion*.

TRAXLER, M.J. & GERNSBACHER, M.A. (in press). Improving written communication through minimal feedback. *Language and Cognitive Processes*.

GERNSBACHER, M.A. , & ROBERTSON, R.W.R. (in press). How automatically do readers represent characters' emotional states? *Language and Cognitive Processes*.

OAKHILL, J., GARNHAM, A., GERNSBACHER, M.A., & CAIN, K. (in press). How natural are conceptual anaphors? *Language and Cognitive Processes*.

GERNSBACHER, M.A. , & JESCHENIAK, J. Cataphoric devices in spoken discourse. *Cognitive Psychology* (accepted pending revisions).

Articles Under Review

BEEMAN, M., & GERNSBACHER, M.A. Structure building and coherence inferencing during narrative comprehension.

GERNSBACHER, M.A. The mechanisms of suppression and enhancement in comprehension.

IV. ABSTRACTS OF PUBLICATIONS RESULTING FROM AFOSR 89-0258

MECHANISMS THAT IMPROVE REFERENTIAL ACCESS.

Cognition, 32 (1989) 99-156

Two mechanisms, suppression and enhancement, are proposed to improve referential access. Enhancement improves the accessibility of previously mentioned concepts by increasing or boosting their activation; suppression improves concepts' accessibility by decreasing or dampening the activation of other concepts. Presumably, these mechanisms are triggered by the informational content of anaphors. Six experiments investigated this proposal by manipulating whether an anaphoric reference was made with a very explicit, repeated name anaphor or a less explicit pronoun. Subjects read sentences that introduced two participants in their first clauses, for example, "Ann predicted that Pam would lose the track race," and the sentences referred to one of the two participants in their second clauses, "but Pam / she came in first very easily." While subjects read each sentence, the activation level of the two participants was measured by a probe verification task. The first two experiments demonstrated that explicit, repeated name anaphors immediately trigger the enhancement of their own antecedents and immediately trigger the suppression of other (nonantecedent) participants. The third experiment demonstrated that less explicit, pronoun anaphors also trigger the suppression of other nonantecedents, but they do so less quickly — even when, as in the fourth experiment, the semantic information to identify their antecedents occurs prior to the pronouns (e.g., "Ann predicted that Pam would lose the track race. But after winning the race, she ..."). The fifth experiment demonstrated that more explicit pronouns — pronouns that match the gender of only one participant — trigger suppression more powerfully. A final experiment demonstrated that it is not only rementioned participants who improve their referential access by triggering the suppression of other participants; newly introduced participants do so too (e.g., "Ann predicted that Pam would lose the track race, but Kim ..."). Thus, both suppression and enhancement improve referential access, and the contribution of these two mechanisms is a function of explicitness. The role of these two mechanisms in mediating other referential access phenomena is also discussed.

THE CATAPHORIC USE OF THE INDEFINITE THIS IN SPOKEN NARRATIVES.

Memory & Cognition, 17 (1989) 536-540

Are concepts that were introduced with the unstressed, indefinite article this, as opposed to the indefinite article a/an, more accessible from listeners' mental representations? Subjects heard and then verbally continued each of a series of informal narratives. The last clause of each narrative introduced a new noun phrase that began with either the indefinite this or the indefinite a/an (e.g., this egg or an egg). When the concepts were introduced with the indefinite this, subjects referred to them more frequently, often within the first clauses that they produced, and typically via pronouns. In contrast, when the concepts were introduced with a/an, subjects referred to them less frequently and typically via full noun phrases. Thus, concepts introduced with the indefinite this were more accessible; therefore, the indefinite this appears to operate cataphorically to improve referential access.

BUILDING AND ACCESSING CLAUSAL REPRESENTATIONS: THE ADVANTAGE OF FIRST MENTION VERSUS THE ADVANTAGE OF CLAUSE RECENCY

Journal of Memory and Language, 28 (1989) 735-755

We investigated two seemingly contradictory phenomena: the Advantage of the First-Mentioned Participant (participants mentioned first in a sentence are more accessible than participants mentioned second) and the Advantage of the Most Recent Clause (concepts

mentioned in the most recent clause are more accessible than concepts mentioned in an earlier clause). We resolved this contradiction by measuring how quickly comprehenders accessed participants mentioned in the first versus second clauses of two-clause sentences. Our data supported the following hypotheses: Comprehenders represent each clause of a two-clause sentence in its own mental substructure. Comprehenders have greatest access to information in the substructure that they are currently developing, that is, they have greatest access to the most recent clause. However, at some point, the first clause becomes more accessible because the substructure representing the first clause of a two-clause sentence serves as a foundation for the whole sentence-level representation.

INVESTIGATING DIFFERENCES IN GENERAL COMPREHENSION SKILL
Journal of Experimental Psychology: L, M, and C, 16 (1990) 430-445

For adults, skill at comprehending written language correlates highly with skill at comprehending spoken language. Does this General Comprehension Skill extend beyond language-based modalities? And if it does, what cognitive processes and mechanisms differentiate individuals who are more versus less proficient in General Comprehension Skill? In our first experiment, we found that skill in comprehending written and auditory stories correlates highly with skill in comprehending nonverbal, picture stories. This finding supports the hypothesis that General Comprehension Skill extends beyond language. We also found support for the hypotheses that poorer access to recently comprehended information marks less proficient General Comprehension Skill (Experiment 2) because less-skilled comprehenders develop too many mental substructures during comprehension (Experiment 3), perhaps because they inefficiently suppress irrelevant information (Experiment 4). Thus, the cognitive processes and mechanisms involved in capturing and representing the structure of comprehensible information provide one source of individual differences in General Comprehension Skill.

The mechanism of suppression: A component of general comprehension skill
Journal of Experimental Psychology: L, M, and C (1991) 17, 245-262

We investigated whether the cognitive mechanism of suppression underlies differences in adult comprehension skill. In Gernsbacher, Varner, & Faust (1990), we found that less-skilled comprehenders less-efficiently suppress the inappropriate meanings of ambiguous words (e.g., the playing card vs garden tool meaning of *spade*). In the present research, we found that less-skilled comprehenders less-efficiently suppress the incorrect forms of homophones (e.g., *patients* vs *patience*), the typical-but-absent members of scenes (e.g., a *tractor* in a *farm* scene), and words superimposed on pictures or pictures surrounding words. Less-skilled comprehenders are not less-efficient in activating contextually appropriate information; in fact, they activate contextually-appropriate information more strongly than more-skilled comprehenders do. Instead, they suffer from less-efficient suppression mechanisms. We conclude that the mechanism of suppression is a component of general comprehension skill.

COMPREHENDING CONCEPTUAL ANAPHORS
Language and Cognitive Processes, 6 (1991) 81-105

English pronouns must agree with their antecedents in number. But in some situations, pronouns violate this constraint, as in "I think I'll order a *frozen margarita*. I just love *them*." Three situations are identified in which such violations occur: (1) Plural (and technically illegal) pronouns are used to refer to Frequently or Multiply occurring Items or Events (as opposed to a Unique Item/Event); (2) plural pronouns are used to refer to Generic Types (as opposed to a Specific Token); and (3) plural pronouns are used to refer to animate members of a Collective Set (as opposed to an Individual Member of a set).

When sentences contained illegal, plural pronouns that referred to Multiple Items/Events, Generic Types, or Collective Sets, they were rated more natural (Experiment 1) and comprehended more rapidly (Experiment 2) than when the same sentences contained legal, singular pronouns. But when the sentences contained legal, singular pronouns and referred to Unique Items/Events, Specific Tokens, or Individual Members of a set, they were rated more natural and comprehended more rapidly. The results underscore the role that pragmatic information — perhaps in the form of mental models — plays in the on-line interpretation of conceptual anaphors, such as pronouns.

DO READERS REPRESENT CHARACTERS' EMOTIONAL STATES? *Cognition & Emotion*.(in press)

Subjects read stories that described concrete actions, such as a main character stealing money from a store where his best friend worked and later learning that his friend had been fired. Following each story, subjects read a target sentence that contained an emotion word that either matched the emotional state implied by the story (e.g., *guilt*) or mismatched that emotional state. In Experiment 1, target sentences were read more slowly when the mismatched emotion words were the perceived opposites of the emotional states implied by the stories (e.g., *pride*). In Experiment 2, target sentences were read more slowly when the mismatched emotion words shared the affective valence of the implied emotional state; therefore, readers must represent more than simply the affective valence of the emotional states. Instead of reading target sentences that contained matching versus mismatching emotion words, subjects in Experiment 3 simply pronounced matching versus mismatching emotion words. Mismatching emotion words were pronounced more slowly. These experiments suggest that readers form explicit, life-like, mental representations of fictional characters' emotional states, and readers form these representations as a normal part of reading comprehension.

IMPROVING WRITTEN COMMUNICATION THROUGH MINIMAL FEEDBACK *Language and Cognitive Processes*.(in press)

We propose that writers must form accurate representations of how their readers will interpret their texts to successfully convey their ideas. In two experiments, we investigated whether getting feedback from their readers helps writers form better representations of how their texts are interpreted. In our first experiment, one group of subjects (writers) wrote descriptions of a set of geometric figures; another group of subjects (readers) read those descriptions and used them to select the figures from sets of similar looking distractor figures. Half the writers received feedback on how well their readers selected the figures, and half the writers did not receive this feedback. Writers who received feedback improved their descriptions more than writers who did not receive feedback. In our second experiment, half the writers received two treatments of feedback on their descriptions of one set of figures, while the other half of the writers did not receive feedback. Then, all writers described a new set of figures. Writers who had previously received feedback wrote better new descriptions than did writers who had never received feedback. We concluded that feedback — even this minimal form of feedback — helps writers envision how readers interpret their texts.

HOW AUTOMATICALLY DO READERS REPRESENT CHARACTERS' EMOTIONAL STATES? *Language and Cognitive Processes*.(in press)

We investigated the role that knowledge activation and sentence mapping play in how readers represent fictional characters' emotional states. Subjects read stories that described concrete actions, such as a main character stealing money from a store where his best friend worked and later learning that his friend had been fired. By manipulating the content of the

stories (i.e., writing stories that implied different emotional states), we affected what emotional knowledge would be activated. Following each story, subjects read a target sentence that contained an emotion word. By manipulating the emotion word in each target sentence (i.e., whether it matched vs mismatched the emotional state implied by the story), we affected how easily subjects could map the target sentence onto their developing mental structures. In Experiment 1, we further isolated the role of knowledge activation from the role of sentence mapping with a density manipulation. When subjects read many emotional stories, they more widely activated their knowledge of emotional states. Using a proportionality manipulation in Experiment 2, we demonstrated that this result was not due to subjects' strategies.

CATAPHORIC DEVICES IN SPOKEN DISCOURSE. *Cognitive Psychology* (accepted pending revisions)

We propose that speakers mark key words with *cataphoric devices*. Cataphoric devices are counterparts to anaphoric devices: Just as anaphoric devices enable backward reference, cataphoric devices enable forward reference. And just as anaphoric devices mark concepts that have been mentioned before, cataphoric devices mark concepts that are likely to be mentioned again. We investigated two cataphoric devices: spoken stress and the indefinite *this*. Our four experiments demonstrated that concepts marked by cataphoric devices gain a privileged status in listeners' mental representations: Cataphorically marked concepts are more activated; they are better at suppressing the activation of other concepts; and they better resist being suppressed by other concepts.

STRUCTURE BUILDING AND COHERENCE INFERENCING DURING NARRATIVE COMPREHENSION Article under review

People recall stories in episodes, and their recall often includes inferences. To study when people capture the episode organization of stories, we capitalized on their tendency to draw coherence inferences (inferences that resolve a discrepancy between a previous state and a changed state). While subjects listened to stories that promoted coherence inferences, they pronounced test words that were related or unrelated to the inferences. Between the sentence presenting the previous state and the sentence indicating a changed state we presented a sentence that either continued the ongoing episode or cued a new episode. When the sentence continued the episode, test words related to the inferences were pronounced reliably faster than unrelated (control) words. In contrast, when the intervening sentence cued a new episode, test words related to the inferences were pronounced no more rapidly than control words. These data suggest that inferences are harder to draw across episodes than within the same episode. Thus, we suggest that listeners structurally organize their mental representations of stories into episodes during comprehension.

V. PERSONNEL SUPPORTED BY AFOSR 89-0258

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IV. INTERACTIONS RESULTING FROM AFOSR 89-0258

Invited Presentations

Invited Colloquia: University of California, Berkeley, April, 1991; University of Georgia, March, 1991; University of Chicago, January, 1991; University of Wisconsin, November, December, 1990; University of California, San Diego, October, 1990; University of Edinburgh, UK, July, 1990; University of Glasgow, UK, July 1990; University of Durham, UK, July 1990; University of Cadiz, Spain, June 1990; University of La Laguna, Spain, June, 1990; Max Planck Institute for Psycholinguistics, the Netherlands, June, 1990; University of Padova, Italy, June, 1990; University of Bologna, Italy, June, 1990; University of Barcelona, Spain, May, 1990; University of Salamanca, Spain, May, 1990; Cambridge University, UK, May, 1990; Sussex University, UK, April, 1990; University of Exeter, UK, April, 1990; Carnegie-Mellon University, November, 1989; University of Pittsburgh, November, 1989; University of Massachusetts, May, 1989; University of Colorado, March, 1989.

Invited Addresses: Keynote Speaker, First NSF Korea-US Cooperative Conference on Cognitive Science, Seoul, Korea, August, 1991; First Evan L. Brown Memorial Lecturer, University of Nebraska at Omaha, April, 1991; Keynote Speaker at the Third Annual CUNY Conference on Human Sentence Processing, March, 1990

Referred Presentations

GERNSBACHER, M.A., & JESCHENIAK, J. (1989). *Cognitive effects of contrastive (spoken) stress*. Paper presented at the 30th annual meeting of the Psychonomic Society; Atlanta, GA.

GERNSBACHER, M.A., BOLLIGER, C.M., MARRON, M.A., ROBERTSON, R.R.W., TRAXLER, M.J., VILLA-GOOD, V.M. (1991). *Cognitive processes in reading, writing, and listening*. Symposium presented at the 71st annual convention of the Western Psychological Association, San Francisco, CA.

GERNSBACHER, M.A., & ROBERTSON, R.R.W. (1991). *The indefinite article the facilitates mapping*. Paper to be presented at the 32nd annual meeting of the Psychonomic Society; San Francisco, CA.