

PLAN UNDERSTANDING, NARRATIVE COMPREHENSION, AND STORY SCHEMAS*

William F. Brewer
Department of Psychology
University of Illinois
603 East Daniel Street
Champaign, IL 61820

ABSTRACT

This paper proposes that a comprehensive theory of stories must include components that deal with: (a) plan understanding, (b) narrative comprehension, and (c) the unique structural and affective aspects of the subclass of narratives that are stories.

A. Introduction

This paper outlines a position on the structure of theories of stories and then examines recent work in artificial intelligence in terms of this framework. The paper will also refer to empirical findings from psychology where they are relevant to the theoretical issues at hand.

In order to construct an adequate theory of stories, it is necessary to distinguish between theories of plan understanding, theories of narrative comprehension, and theories of the story schema. Theories of plan understanding attempt to account for how observers interpret human actions in terms of underlying plans. Theories of narrative comprehension attempt to give an account of how narrative discourse is processed to produce an underlying cognitive representation. Theories of stories attempt to account for the unique properties of the subclass of narrative discourses that are stories.

B. Plan Understanding

Since most stories deal with the goal-directed actions of one or more characters, an adequate theory of stories should include a plan-understanding component to explain how the reader reconstructs the character's intentions from the described actions (c.f. [8], [9]).

Researchers from artificial intelligence have made a number of important contributions in this area. Schmidt, Sridharan and Goodson [17] developed a system (BELIEVER) that attempts to account for how an observer of an action carries out plan understanding. Both Meehan's work [15] and Wilensky's work [21] have been directed at developing a theory of stories qua stories (c.f. [15] p. 115; [21] p. 65); however, in practice Wilensky's

* This research was supported in part by the National Institute of Education under Contract No. HEW-NIE-C-400-76-0116.

program (PAM) focuses almost completely on the problems of plan understanding and Meehan's program (TALE-SPIN) focuses almost completely on the problem of plan production in three-dimensional space. Overall, this work on plan recognition has probably been the area where artificial intelligence has made the greatest contribution to the development of a comprehensive theory of stories. None of the other disciplines studying stories (linguistics, literary theory, psychology) have given as detailed and as analytic an account of the processes involved in going from observed actions to postulated plans as has the work in artificial intelligence.

A recent series of empirical studies [4], [12] emphasizes the importance of plan comprehension as a component of an overall story theory and suggests the need for reinterpretation of some of the psychological theories of stories. Lichtenstein and Brewer [12] showed subjects videotapes of an actor carrying out a goal-directed action (e.g., setting up a slide projector) and then tested the subjects' recall of the actions. We found that goal-directed actions were recalled better than non-goal-directed actions; that actions higher in the plan hierarchy were recalled better than actions lower in the hierarchy; and that actions presented out of canonical plan position shifted back to canonical position in recall. These results are essentially the same as those found in psychological studies of story recall [14], [18], [20] that have been taken to support the story grammars as theories of stories. The replication of the standard story recall findings with recall of a simple observed goal-directed action strongly suggests that the story grammar findings are not due to story structure, but are predominately due to the effects of plan schemas that subjects imposed on the actions of the characters in the passages they heard. Thus, analysis of recent work in psychology and artificial intelligence suggests that plan understanding is an important component of a theory of stories.

C. Narrative Understanding

A narrative is a text that describes a sequence of events (and since most narratives are about people they tend to be descriptions of goal-directed actions). Thus, in constructing a theory of narratives one must carefully distinguish between the actions described in a narrative (event structure) and the linguistic repre-

sentation of the actions in the narrative (discourse structure). This is a traditional distinction in literary theory [7], [19] and provides, for text structure, the same kind of theoretical power that the distinction between surface structure and deep structure provides for the analysis of sentences.

The author of a narrative text must make decisions about: (a) how much of the information from the underlying event sequence is to be placed explicitly in the text, and (b) how to order the information in the text (for a more detailed discussion see [3]).

1. Narrative completeness - In ordinary narratives much of the information about the underlying events is omitted from the text, and thus a theory of narrative comprehension must include components that allow the reconstruction of the underlying event information from the text. This problem (usually described as the inference problem) is one that has attracted much attention by researchers in artificial intelligence (e.g., [16]) and has led to much interesting research.

2. Narrative organization - The issue of narrative organization has attracted considerable work in literary theory [19], and psychologists have tried to deal with some aspects of the issue by adding a transformational component to story grammars [10]. However, there is a serious gap in recent work on this topic in artificial intelligence. There has been much research on narrative understanding at the sentence level [23], but little concern with global narrative structures. Thus, current models in artificial intelligence cannot deal with ordinary phenomena such as flashbacks and flashforwards. Meehan's program (TALE-SPIN) primarily focuses on the problem of plan production, but it does contain one device that functions at the level of narrative organization. When two characters are carrying out a sequence of events at the same time, the program gives the entire event sequence for one character and then shifts to the other character (rather than intertwining the events in the narrative). Clearly theories in the area of artificial intelligence need a component to deal with narrative organization and, to the degree to which they are intended to map psychological processes, they must give an account of the ease or difficulty of comprehension of different narrative organizations.

D. Story Schemas

1. Stories vs. narratives - A number of recent researchers have argued that stories must be distinguished from the larger class of narratives [1], [5], [6], [9], [11]. These theorists share the intuition that stories have special properties and that theories of stories must deal with constructs such as conflict, suspense, and interest-ness. However, not all recent story theories agree that stories must be distinguished from narratives. Theories in the story grammar tradition [14] and simple plan-based theories [2] do not make such a distinction, and both classes of theo-

ries would consider a narrative describing someone tying their shoe to be a story.

2. Difficult goal theories - Most of the recent artificial intelligence research on stories has taken a clear position in favor of distinguishing stories from narratives (e.g., [15], [21], [22]). The general position adopted by these theorists is that stories are the set of goal-directed actions in which a character faces a difficult goal and has trouble fulfilling this goal. This approach captures the intuition that stories have special properties and gives a partial account of issues such as conflict and suspense.

However, Brewer and Lichtenstein [5] have made strong arguments against this position. We argue that this approach places the crucial features of what makes something a story in the wrong locus. It is what the reader feels that is crucial, not the difficulty the character is having. For many stories the two approaches agree, since when the character is facing severe difficulties the reader will be in suspense. However, there are narratives which act as a crucial test of the two views: consider a narrative in which the character is carrying out some mundane plan (for example, driving home) and facing no problems reaching his goal, yet the reader is in suspense because the reader has some significant information (for example, that the gas line is leaking and the car may explode). The difficult-goal approach would classify this text as a non-story, whereas the reader-affect approach would classify this text as a story. In Brewer and Lichtenstein [5] we obtained story intuition data from a group of subjects showing that this type of narrative is, in fact, considered to be a story, thus supporting the reader-affect position.

3. A structural-affect theory - In several recent papers [5], [6] we have attempted to develop a theory of the reader's story schema. We have assumed a theory of plan understanding and a theory of narrative comprehension and have attempted to deal with the unique characteristics of stories. We argue that stories are a subclass of narratives which have entertainment as their primary discourse force. We postulate that the entertainment function is carried out by producing certain affective states in the reader (e.g., suspense, surprise, curiosity), and that the affective states are produced by the inclusion of certain types of events in the event structure of narratives and by particular arrangements of the discourse with respect to the underlying events. This approach has a number of important consequences: (a) It gives a detailed account of the differences between stories and simple narratives. (b) It captures the intuitions that a story theory ought to include constructs such as suspense and surprise. (c) It suggests that theories of stories should not be evaluated with comprehension or memory criteria, but with story intuitions, story-liking judgments, and affect judgments. While our particular theory of stories may be incorrect, it appears to us that any adequate theory of stories is going to have to deal with the

issues raised by this approach.

E. Conclusion

Overall, it seems that the distinctions outlined above, between theories of plan understanding, theories of narrative comprehension, and theories of the story schema, make for conceptual clarity and, when applied to the recent work on stories in artificial intelligence, provide a number of suggestions for future development.

REFERENCES

- [1] de Beaugrande, R., and Colby, B.N. "Narrative Models of Actions and Interaction." Cognitive Science, 3, (1979) 43-66.
- [2] Black, J.B., and Bower, G.H. "Story Understanding as Problem-Solving." Poetics, 9, (1980) 223-250.
- [3] Brewer, W.F. "Literary Theory, Rhetoric, and Stylistics: Implications for Psychology." In R.J. Spiro, B.C. Bruce, and W. F. Brewer (Eds.), Theoretical Issues in Reading Comprehension: Perspectives from Cognitive Psychology, Linguistics, Artificial Intelligence, and Education. Hillsdale, N.J.: Erlbaum, 1980.
- [4] Brewer, W.F., and Dupree, D.A. "Use of Plan Schemata in the Recall and Recognition of Goal-Directed Actions." Journal of Experimental Psychology: Learning, Memory and Cognition, in press.
- [5] Brewer, W.F., and Lichtenstein, E.H. "Event Schemas, Story Schemas, and Story Grammars." In J. Long and A. Baddeley (Eds.), Attention and Performance IX. Hillsdale, N.J.: Erlbaum, 1981.
- [6] Brewer, W.F., and Lichtenstein, E.H. "Stories are to Entertain: A Structural-Affect Theory of Stories." Journal of Pragmatics, in press.
- [7] Chatman, S. Story and Discourse. Ithaca, N.Y.: Cornell University Press, 1978.
- [8] van Dijk, T.A. "Action, Action Description, and Narrative." New Literary History, 6, (1975) 273-294.
- [9] van Dijk, T.A. "Philosophy of Action and Theory of Narrative." Poetics, 5, (1976) 287-338.
- [10] Johnson, N.S., and Mandler, J.M. "A Tale of Two Structures: Underlying and Surface Forms in Stories." Poetics, 9, (1980) 51-86.
- [11] Kintch, W. "Learning from Text, Levels of Comprehension, or: Why Anyone Would Read a Story Anyway." Poetics, 9, (1980) 87-98.
- [12] Lichtenstein, E.H., and Brewer, W.F. "Memory for Goal-Directed Events." Cognitive Psychology, 12, (1980) 412-445.
- [13] Mandler, J.M. "A Code in the Node: The Use of Story Schema in Retrieval." Discourse Processes, 1, (1978) 14-35.
- [14] Mandler, J.M., and Johnson, N.S. "Remembrance of Things Parsed: Story Structure and Recall." Cognitive Psychology, 9, (1977) 111-151.
- [15] Meehan, J.R. "The Metanovel: Writing Stories by Computer." New Haven, CN: Yale University Department of Computer Science, Research Report No. 74. 1976.
- [16] Schank, R.C. Conceptual Information Processing. Amsterdam: North-Holland, 1975.
- [17] Schmidt, C.F., Sridharan, N.S., and Goodson, J.L. "The Plan Recognition Problem: An Intersection of Psychology and Artificial Intelligence." Artificial Intelligence, 11, (1978) 45-83.
- [18] Stein, N.L., and Nezworski, T. "The Effect of Organization and Instructional Set on Story Memory." Discourse Processes, 1, (1978) 177-193.
- [19] Sternberg, M. Expositional Modes and Temporal Ordering in Fiction. Baltimore: Johns Hopkins University Press, 1978.
- [20] Thorndyke, P.W. "Cognitive Structures in Comprehension and Memory of Narrative Discourse." Cognitive Psychology, 9, (1977) 77-110.
- [21] Wilensky, R. "Understanding Goal-Based Stories." New Haven, CN: Yale University Department of Computer Science, Research Report No. 140. 1978.
- [22] Wilensky, R. "Points: A Theory of Story Content." Berkeley, CA: University of California, Electronics Research Laboratory, Memorandum No. UCB/ERL M80/17, 1980.
- [23] Winograd, T. Understanding Natural Language. New York: Academic Press, 1972.