Cognitive and Computer Systems for Understanding Narrative Text

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Abstract

This project continues our interdisciplinary research into computational and cognitive aspects of narrative comprehension. Our ultimate goal is the development of a computational theory of how humans understand narrative texts. The theory will be informed by joint research from the viewpoints of linguistics, cognitive psychology, the study of language acquisition, literary theory, geography, philosophy, and artificial intelligence. The linguists, literary theorists, and geographers in our group are developing theories of narrative language and spatial understanding that are being tested by the cognitive psychologists and language researchers in our group, and a computational model of a reader of narrative text is being developed by the AI researchers, based in part on these theories and results and in part on research on knowledge representation and reasoning. This proposal describes the knowledge-representation and natural-language-processing issues involved in the computational implementation of the theory; discusses a contrast between communicative and narrative uses of language and of the relation of the narrative text to the story world it describes; investigates linguistic, literary, and hermeneutic dimensions of our research; presents a computational investigation of subjective sentences and reference in narrative; studies children's acquisition of the ability to take third-person perspective in their own storytelling; describes the psychological validation of various linguistic devices; and examines how readers develop an understanding of the geographical space of a story. This report is a longer version of a project description submitted to NSF. **This document, produced in May 2007, is a LaTeX version of *Technical Report 89-07* (Buffalo: SUNY Buffalo Department of Computer Science, August 1989), with slightly updated references.**

1 Introduction

This project continues our interdisciplinary research into computational and cognitive aspects of narrative comprehension (Bruder, Duchan, et al. 1986; Rapaport et al. 1989). Our ultimate goal is the development of a computational theory of how humans understand narrative texts. The theory will be informed by joint research from the viewpoints of linguistics, cognitive psychology, the study of language acquisition, literary theory, geography, philosophy, and artificial intelligence. The linguists, literary theorists, and geographers in our group are developing theories of narrative language and spatial understanding that are being tested by the cognitive psychologists and language researchers in our group, and a computational model of a reader of narrative text is being developed by the AI researchers, based in part on these theories and results and in part on research on knowledge representation and reasoning.

The central theme of this joint project is the notion of a "deictic center". When deictic terms such as 'come' and 'go', 'now' and 'then', and 'I' and 'you' are used in face-to-face dialogues, their meanings depend on the spatio-temporal co-ordinates of the act of utterance (Lyons 1977). These co-ordinates originate at a point we call the *deictic center* (DC), consisting of the "origin" of place ('come' and 'go'), time ('now' and 'then'), and person ('I' and 'you') (cf. Bühler 1934, Fillmore 1975, Traugott 1978). We call the "origin" of place the *WHERE*, the "origin" of time the *WHEN*, and the "origin" of person the *WHO*.

Interestingly, deictic terms occur in third-person narratives, even though, strictly speaking, there is no relevant "act of utterance". They are not understood in terms of a speaker and an addressee. The "here" and "now" of the story do not derive from the spatio-temporal co-ordinates of the author at the time of writing nor of the reader at the time of reading (cf. Hamburger 1973, Banfield 1982). Instead, there is a *narrative DC* consisting of a narrative WHO, a narrative WHEN, and a narrative WHERE, which the reader must keep track of, if deictic terms are to be understood properly.

The reader's construction and modification of the DC is important for understanding a narrative. The DC is in the reader's mind; it is one contribution that the reader makes to understanding the narrative. The events that carry the temporal and spatial core of the narrative are linguistically and conceptually constrained according to certain principles that can be relatively well defined. A narrative obviously unfolds linguistically one word, or one sentence, at a time. We suggest that cognitively a narrative usually unfolds one place and time at a time. This spatio-temporal location functions as the DC of the narrative. It is the "here" and "now" of the reader's "mind's eye" in the world of the story. The DC moves temporally and spatially as the center of activity advances and shifts. It also includes the perspective from which the events are described—the "I" changes as the perspective shifts from character to character. The DC is an appropriate and useful data structure for representing and integrating the information in narrative and is thus a useful construct for studying how local sentence interpretation is integrated into more global comprehension of narrative text.

Cognitive-science research on human understanding of narrative text has taken two approaches. A bottom-up approach emphasizes local textual cohesion on the clause or sentence level (e.g., Halliday & Hasan 1976). This is clearly important, since the reader's understanding begins at this level. But this approach has a major limitation: it is too specific, failing to account for the reader's ability to understand the global structure of the text. Moreover, our group's approach seeks to explain cohesion not in terms of the text alone, but in terms of the reader's constructive contribution to the text: while reading, the reader constructs a mental model of the story and story world presented by the narrative text (cf. Kamp's discourse representation structures (1983, 1984, 1985) and Webber's event-situation structures (1987)). Textual elements are cohesive just in case they are linked to the same, or related, elements of the mental model. The other approach to human understanding of narrative text is a top-down approach emphasizing global coherence, as in story grammars (Rumelhart 1975) or scripts (Schank & Abelson 1977). This, too, is important, but its limitation is that it is too general: there is a gap between these two approaches. This gap, we claim, is filled in part by the DC. We seek to understand how the reader is able to construct the DC to track movement through the story world in space, time, and person on the basis of local textual cohesive devices, and how the reader is able to use the DC to aid in understanding the global coherence of the narrative. While other researchers (e.g., Allen & Perrault 1980, Grosz 1981, Sidner 1983, Kintsch & Van Dijk 1978, Reichman 1985, Grosz & Sidner 1986, Fox 1987) have studied discourse in general and dialogue in particular, usually from the point of view of only one or two of the cognitive sciences, our focus is on narrative text from the viewpoints of several of the cognitive sciences. We are attempting to reinterpret and advance such work in part by comparing and contrasting conversational discourse and narrative text.

Based on our research to date on the DC, we have found a particular line of inquiry to be especially productive.

The inquiry focuses on the following claims of what we call the Deictic Shift Theory:

(1) In a fictional narrative, the deictic field (the plane from which the coordinates of WHERE/WHEN/WHO are derived) is shifted from its usual anchorage in the act of utterance (the I/YOU of communication) into a constructed anchorage in the selves of fictive subjects, i.e. characters (Hamburger 1973; Kuroda 1973, 1976; Banfield 1982);

(2) Each sentence of a fictional narrative must be attributed to one of two ontological contexts: objective or subjective (Kuroda 1973, Banfield 1982, Wiebe & Rapaport 1988). Objective contexts are those which are not mediated by epistemology; that is, their propositional content is simply given as true (in the story world), without need of justification or proof. Subjective contexts are those which are mediated by epistemology, often that of a character, and thus structured by the character's perceptions, thoughts, knowledge, intentions, goals, and other psychological attributes. The propositional content of subjective contexts must be understood with respect to a character's judgment and experience, and thus is open to question. In addition, the force of expressive language in subjective contexts is referable to the HERE/NOW/SELF of the character rather than to a SPEAKER position occupied by the author or "narrator". We call the character whose epistemology governs subjective contexts the *subjective character* (Wiebe & Rapaport 1988), or the *focalizing WHO*.

These two assertions are both the result of and the stimulus for much of our research. For example, we are testing the hypothesis that, in subjective contexts, the following textual features are determined by the subjective character's epistemology rather than by the communicative situation between the author and reader: definite vs. indefinite reference (§§3, 6); proper names and other referential noun phrases (§§4, 5, 6); "expressive elements" such as curses, exclamations, and questions (§5); evaluative adjectives (§6); verb tense and aspect (§4); topic markers (§4); logical connectives (§§3, 6, 7); deictic verbs and adverbs (§§7, 8); presentative structure (§§4, 6); and sentence modality (§6). Further, we believe that the deictic shift affects the reader's construction of the text with regard to story understanding (§5, 6); recognition of boundaries between objective and subjective contexts (§6), knowledge-representation issues (§2); the logic of fictional worlds (§3); the application of Gricean principles to fictional text (§3, 5); the place of fictional narration in speech-act theory (§3); and the imaginative construction of geographical space (§9). Finally, we believe that the deictic shift has great consequences for theories of a reader or teller's affective and experiential orientation in a story world: how a reader identifies with fictive subjects (§8); how a child narrator orients herself toward the story world she creates (§7); and how a reader "enters" geographic space in fictional vs. practical situations (§§5, 9).

In the following sections, we discuss the individual portions of our project:

1. a description of the knowledge-representation and natural-language-processing issues involved in the computational implementation of the theory;
2. a contrast between communicative and narrative uses of language and a discussion of the relation of the narrative text to the story world it describes;
3. a discussion of linguistic devices;
4. a discussion of the literary and hermeneutic dimensions of our research;
5. a computational investigation of subjective sentences and reference in narrative;
6. a study of children's acquisition of the ability to take third-person perspective in their own storytelling;
7. a description of the psychological validation of various linguistic devices; and
8. an examination of how readers develop an understanding of the geographical space of a story.

2 Implementation and Knowledge-Representation Issues (William J. Rapaport, Stuart C. Shapiro)

The computer system that will read and understand narratives is being implemented in the SNePS knowledge-representation and reasoning system (Shapiro 1979) and forms a part of the SNePS/CASSIE project (Shapiro & Rapaport 1987). The long term goal of this project is to understand the nature of intelligent cognitive processes by developing and experimenting with a computational cognitive agent that will be able to use and understand natural language, and will be able to reason and solve problems in a wide variety of domains. SNePS supports nested beliefs, meta-knowledge, and meta-reasoning; it has an inference package that interprets rules represented in SNePS, performing bi-directional inference and making use of universal, existential, and numerical quantifiers and a specially-designed set of propositional connectives that includes both true negation and negation-by-failure; it also uses path-based inference; and it can be interfaced with SNeBR, the SNePS Belief Revision system, based on SWM, the only extant, worked-out logic of assumption-based belief revision (Martins & Shapiro 1988). A Generalized Augmented Transition Network interpreter/compiler allows the specification and use of a combined parsing-generation grammar, which can be used to parse a natural-language sentence into a SNePS network, generate a natural-language sentence from a SNePS network, and perform any needed reasoning along the way (Shapiro 1982). SNePS/CASSIE is based on a theory of Fully Intensional Knowledge Representation, according to which we are developing knowledge-representation constructs and grammars for CASSIE, the Computational Cognitive Mind we are developing and experimenting with, successive versions of which represent an integration of all our current work.

Three major components of the implementation of the DC are in various stages of completion. Almeida 1987 reports on the implementation of part of our theory of WHEN; Yuhan 1991 describes the (already existing) implementation of part of our theory of WHERE; and the groundwork for the representation of issues related to WHO can be found in Rapaport 1986 and Wiebe & Rapaport 1988.

Two ongoing knowledge-representation projects foundational to our DC research are:

(a) The re-implementation of SNePS. The work thus far on the deixis-in-narrative project has been done in SNePS-79; SNePS-2 is a re-implementation of SNePS in Common Lisp that uses the principles of data abstraction and that enforces some of the theoretical principles underlying SNePS. Part of the task will be to incorporate the work already done into a single grammar for use with SNePS-2.

(b) Representation of fictional objects. Since SNePS is an intensional knowledge-representation system, there is no problem in principle of representing fictional or other non-existent objects. The difficulties are in the details. As Cassie reads a narrative, she constructs—with the aid of the DC—a mental model or representation of the story told by the narrative, as well as of the story-world within which the story takes place. One representational issue that must be faced is whether and to what extent this model should be segregated from Cassie's other beliefs. On the one hand, insofar as Cassie "knows" that she is reading fiction, she should not merely incorporate the story into her set of beliefs. On the other hand, a reader of fiction must bring background ("world") knowledge to bear on the understanding of the narrative, and the narrative may produce changes in Cassie's beliefs or understanding, so the mental model cannot be entirely distinct from the rest of Cassie's beliefs. A related problem concerns (historical and other) narratives that contain references to "real" people, places, or events (or fictionalized versions thereof). In SNePS, such entities are represented by nodes in the semantic network. The issue is whether such "real" entities should be represented by the same nodes as the nodes Cassie already uses to represent the actual entities. Such node sharing would clearly facilitate Cassie's ability to bring her antecedent beliefs about these entities to her understanding of the narrative. But it would equally clearly make it difficult for her to isolate what the narrative claims about these entities from what Cassie believes about them, without some mechanism to distinguish the two kinds of information. An alternative approach, which we favor, is to use separate nodes, with one node being marked as representing a fictional counterpart of the individual represented by the other node. We intend to explore the relative merits of both of these approaches (which may be complementary, rather than competing), in the context of our group's study of the nature of fictional language (cf. §§3, 5, 6 below) and philosophical investigations of counterpart theory and similar relations (Lakoff 1968; Lewis 1968; Castañeda 1972, 1975; Kamp 1983, 1984, 1985; Asher 1986).

Other, related work on knowledge representation for natural-language understanding that is important for the DC project includes: (1) The representation of natural category systems, taking seriously the unique nature of basic-level categories within natural category systems (cf. Rosch 1978) and examining the implications of this for knowledge-representation and natural-language processing; issues affected by this distinction include choice of category name when generating descriptive phrases, inheritance within the category system, and implicit introduction

of referents into a discourse (cf. Peters & Shapiro 1987ab; Peters, Shapiro, & Rapaport 1988). (2) Understanding pictures with captions: This is a relatively unexplored area of integrating visual and linguistic information. The specific application is understanding newspaper pictures with accompanying captions, though we hope to apply the results to children's illustrated narratives. In order to realize the significance of a newspaper photograph and the context it refers to, it is necessary to read the caption associated with it. The reverse is also true, since the caption alone does not provide all the information, thereby necessitating inspection of the picture. Thus, we integrate information obtained through picture processing with information obtained from semantic processing of the caption in order to achieve total understanding. (3) Automatic acquisition of word meanings from natural-language contexts: Readers of text, narrative or otherwise, occasionally come across unknown words or known words used in a new way. We are researching computational theories and techniques whereby a cognitive agent may acquire word meanings from natural-language contexts, both expository and fictional. The meaning of a word as understood by such an agent is taken to be its relation to the meanings of other words in a highly interconnected network representing the agent's knowledge. However, because such knowledge is very idiosyncratic, we research the means by which an agent can abstract conventional definitions from its individual experiences with a word. We are investigating the nature of information necessary to the production of such conventional definitions, and the processes of revising hypothesised definitions in the light of successive encounters with a word.

3 Implications for a General Conception of Narrative (Erwin M. Segal, William J. Rapaport, Carol Siegel)

3.1 Narrative Acts

3.1.1 Theory of Narrative Acts

The study of the role of the DC and the study of other aspects of narrative structure has led us to question certain widely accepted ideas about the communicative nature of all language use. One of the more dominant ideas in the structure of linguistic discourse is that language is designed to conform to a speaker-hearer model in which the speaker performs an illocutionary act directed at the hearer. This model was put forth by Austin (1962) and strongly defended by Searle (1969, 1975; Searle & Vanderveken 1985) and others (Ross 1970, Bach & Harnish 1979), and has been investigated computationally (e. g., Cohen & Perrault 1979, Allen & Perrault 1980). The concept of a speaker performing illocutionary acts to a hearer has extended to narrative texts as well, either as the writer talking directly to the reader (Searle 1983) or as a narrator speaking to a narratee (Prince 1982, Chatman 1978, McHale 1983).

Banfield (1982) has presented syntactic arguments and evidence that strongly suggest that the syntax of narrative text often does not conform to the syntax of a speaker addressing a hearer, and our analyses strongly support the need to find a different set of criteria to motivate the syntax, semantics, lexical selection, and pragmatics of narrative text. Many sentences in narratives have neither the syntax nor the semantics expected in an assertion analysis, whether the asserter be a real author or a fictive narrator. Starting from the premise that real authors write and real readers read even if the form of the sentences are not that of assertion, we plan to investigate what the "speech" acts are that occur in narrative.

We suggest that the language game played by the author of narrative fiction is paradigmatically that of showing or presenting phenomena rather than that of telling or asserting propositions. This is the characteristic of narrative designated by the term *mimesis*, as propounded in Aristotle's *Poetics* and to a lesser extent Plato's *Republic*. Most sentences in narratives *represent* (fictional) reality (Hamburger 1973) rather than *tell* the reader about it, since a primary goal of most narrative text is to place the reader "in" the story world. Significantly, typical sentences in narrative are not assertions from the author to the reader, but direct representations of story reality, and hence not subject to verification. Through the narrative act, the reality of the story world is created as given.

3.1.2 Evidence for the Separate Status of Narrative Acts

Evidence for the different status of the narrative act includes the following linguistic and epistemological features of narrative:

1. Narrative text often uses deictic terms which are not anchored in the spatio-temporal-personal situation of either the speaker or the hearer of the discourse. Instead, these terms are anchored to the entities and events "currently"

presented in the story world.

2. Most narrative texts in English are written primarily in the past tense. Special past tenses are used in other languages (Hamburger 1973, Banfield 1982). This is true regardless of the purported temporal relation between the writer and reader and the story of the narrative. Narratives about both prehistoric times and supposed distant futures are written in the same tense. Although tense is often thought to be directly related to the speech situation (Reichenbach 1947) narrative text is not.

3. It is quite often the case that a narrative uses indefinite determiners to refer to objects or characters who are already identified by the reader. Conversely, definite determiners are often used to refer to entities unknown to the reader. In these cases, the choice of determiner is governed by the state of knowledge of a subjective character rather than, as is the case in conversation, the state of shared knowledge between speaker/author and hearer/reader.

4. Narrative text, and perhaps no other, often ties a temporal adverbial phrase marking the deictic NOW ('now,' 'today') with a past-tense verb ("Now he was happy"). This seeming contradiction has been noted by narratologists and used to support arguments that (a) past tense does not mean "pastness" in narrative (Hamburger 1973), and (b) deixis in narrative is not anchored in the communicative pair of author/reader (Banfield 1982; Kuroda 1973, 1976).

5. In narrative texts, many sentences have the status of being "true" without any epistemological justification. Their presentation often creates the objects and events identified. This is even so when, as in fantasy and science fiction, one finds predicates and events which the reader knows cannot be true, presented to be accepted if the story is to be understood. In the paradigmatic case of this narrative power, narratives can represent the subjectivity of third-person characters without "apology" or argument. The fact that sentences of narrative are not assertions means that "facts" such as a character's feelings or thought process, which in a communicative setting would be subject to questions of evidence, will not be so subject if they are represented in narrative acts (Hamburger 1973; Kuroda 1973, 1976).

6. Narrative texts may present propositions following factive verbs which are not even true in the story world, let alone the "real" world (Banfield 1982). An expression such as "Zoe knew Bill was a spy" can occur when neither the author nor the reader believes that Bill is a spy, even in the story world, if the subjective character believes this to be the case (Wiebe & Rapaport 1988). Techniques for representing such expressions are found in Rapaport 1986.

It is clear that authors use different devices for different reasons. Starting from the premise that real authors rather than fictional narrators speak and write, and real audiences hear and read, we will investigate what kinds of devices narratives contain, and what their functions may be.

3.1.3 Proposed Experiment on Narrative Acts

Speech acts have their illocutionary force and their perlocutionary uptake. Depending upon the interpretation of the intention of the speaker, the hearer responds differently (Austin 1962, Searle 1969, Greenspan & Segal 1984). Similarly, we believe that narrative acts have both an illocutionary and perlocutionary force. If a narrative text is designed for a reader to take a stance within it, that stance should affect how the text is received. Abelson (1975) and Black, Turner, & Bower (1979) have shown behavioral consequences of different stances toward narrative texts. There is much psychological research supporting the more general question of differences in comprehension as a function of the frame within which a text passage is received (Dooling & Lachman 1971; Bransford & Johnson 1972, 1973).

We propose to present the same passage with varying instructions to groups of subjects. One group of readers will be instructed to learn the propositional structure stated and implied in the passage; another, to enjoy and appreciate the passage as a story. After presentation each group will be asked either to tell the story or to list the propositions implied or contained therein. Another two groups will be presented the same content, but in the form of a list of sentences structured as asserted propositions. The same two tasks will follow. The results will be analyzed for logical coherence, number of propositions accurately recalled, conjunctive elements used, represented thought, and markers of subjectivity, using the techniques for recognizing subjective contexts developed by our group (Wiebe & Rapaport

1988). We expect that the text style and instructions will affect the resultant representations in ways significant for our research.

Several issues can be explored with this design. Do subjects remember more when reading for enjoyment, or when reading to learn? Do they remember the same kinds of information? Do readers of propositions abstracted from a story generate stories similar in structure to those who read the story *qua* story? Most theories imply that the mental representations which result from reading a story are propositional structures. But Bruner (1986) offers evidence that retellers of a story reproduce other stylistic indicators from the original text, e.g. markers of subjectivity. We will investigate whether these "output phenomena" are directly correlated with the input text.

3.2 Story Worlds

Related to the problem of narrative acts is the problem of the nature of story worlds. There are several levels of structure within the world of a narrative, and other structures that tie the story world to the world of the author and reader. Narrative theorists such as Pavel (1986) have identified fictional worlds as important conceptual structures, but there is much work left to be done. We have done some preliminary work on the nature of story worlds. Following are some hypotheses to be evaluated theoretically and empirically.

1. Story worlds are constrained by a set of principles which comprise the story-world logic. These principles are established in three ways: (a) by specific mention or demonstration of a novel principle unique to the text which contains it, (b) by implication, principles inferred through similarity with other narratives of the same genre, or (c) by default, principles assumed by recourse to common-sense real-world knowledge or logic. Story worlds must have at most a relatively small number of novel principles.

2. The story world itself contains existents, places, times, and characters (Chatman 1978). These are thought to exist outside of the particular sentences in the text, being constrained by the world's logic.

3. Characters who exist in the story world have psychological states and interests. These may be made explicit, or may have to be inferred, depending on the genre of the narrative.

4. Most story worlds have components which are evaluated. These evaluations are psychological objects which may be identified to belong to a narrator, a character, a narratee, a group, or even some unspecified consciousness. Different genres allow different loci of these evaluations.

5. Story worlds are shaped by a narrative line or plot. This determines the sequence of sentences which present the story world components. This sequence is logically independent of the sequence of events as they occur in the story world, but there are strong pragmatic reasons why they have to be related. Different genres of narrative present the events and their sequence differently.

3.2.1 Experimental Approaches to the Study of Story Worlds

We want to learn which parts of the story world are the most stable and constrained, and which are the most variable. Some parts of the story world are likely to be shared by all readers, whereas other parts are likely to differ from reader to reader. We will explore the characteristics of narratives and of readers which determine these constraints. One method we will use is to characterize and select readers on the basis of certain individual differences: e.g., gender, fiction-reading experience, literary sophistication, college major, and personality traits such as optimism. We will give these readers various passages to read and probe their understanding with a number of techniques, including free and constrained recall (cf. Segal, Duchan, & Scott 1988), and truth-ratings of sentences directly and indirectly relating to the text (cf. Segal, Bruder, & Daniels 1984; Bruder, Engl, & Schultz 1985; Daniels 1986). We will use statements or questions to assess the readers' evaluation of the characters, adoption of characters' point of view, beliefs about the story world, emotional responses to passages, and understanding of the implications and points of the stories.

3.2.2 A Recall and Priming Study of Point of View

In order to understand fictional narrative, the reader mentally constructs a dynamic spatial-temporal model of the narrative world. This mental model (which includes the DC) contains information not only about narrative time and place but also about narrative persons, i.e., characters. Character information establishes reference points from

which the reader can perceive and "live" the changing course of narrative events. Boyum (1985) cites the adopting of character perspective ("point of view", or POV) as "the most significant factor in shaping fiction" both in novels and in films, because it allows the reader (or viewer) to achieve the very purpose of reading or watching movies: "to identify with—even to transform ourselves into—other human beings for awhile and vicariously participate in their lives" (1985: 39)

In order to examine the role of POV in narrative processing, we plan to study natural narrative texts such as Fitzgerald's *The Great Gatsby*, in which there is a consistent epistemological distinction between one character who is the focalizing WHO (Nick Carraway, who is also the narrator) and the central character of the story (Jay Gatsby). I.e., we will look at a narrative in which the reader has access to the subjectivity of only one character, even though that character is not the "story focus." We will begin by presenting undergraduate film majors with excerpts from the novel and asking them to make decisions about where they would position the camera and what would be in camera-view if they were going to film the novel. We will be especially interested to see whether and in what contexts decisions about shifts in camera position correspond to the occurrence of linguistic devices commonly used to establish, maintain, and/or shift the reader's POV. Text sections used will contain linguistic devices hypothesized to affect POV, such as presentative structure, conjoined clauses, and perception verbs. We will test to see which linguistic devices strongly influence subjects' decisions about camera POV.

Next, in order to directly assess the effects of these strong linguistic devices on narrative processing, comprehension, and memory, we will conduct a series of psychological experiments using similar excerpts from *The Great Gatsby* in conjunction with pictures depicting scenes dramatized from these excerpts from either a "correct" or "incorrect" POV. Since POV may affect encoding and retrieval (or comprehension and memory) processes differently, we will use the same (text/picture) pairs of narrative stimuli to test narrative comprehension and narrative memory separately.

With regard to narrative memory, it is hypothesized that:

1. In a timed recognition task, subjects will falsely recognize "correct" (POV congruent) text-picture pairs as having occurred when in fact they saw "incorrect" (POV incongruent) text-picture pairs (that is, where the pictures accurately depict narrative events but these events are pictured from the POV of non-focalizing characters.)

2. In free recall, subjects will unknowingly correct (or edit) narrative passages that are deliberately confusing with regard to linguistic markers of POV. That is, readers will be expected to edit out or change linguistic devices that ordinarily indicate a shifting POV when such devices were embedded in a context that clearly indicated an otherwise stable, non-shifting POV.

Swinney (1984) emphasizes the need to examine narrative comprehension as it occurs in real time by employing "on-line" (reading and reaction-time) as opposed to after-the-fact (recall and recognition) comprehension measures. Because they use a retrospective view of texts read previously, recall and recognition tests do not allow direct assessment of dynamic narrative processing during the act of reading. Although they are appropriate for probing the output of earlier constructive processes, recall and recognition tests are inadequate for capturing the on-line construction and activation of DC components (WHO, WHEN, and WHERE). Two well-known on-line comprehension measures are (a) reading time (the time it takes to read narrative sentences) and (b) reaction time (the time it takes to respond to very rapidly presented single word probes).

Reaction-time measures are considered superior to reading-time measures, because they allow one to assess directly the strength and degree of activation of specific narrative concepts; reading times can only indicate complexity of processing without pinpointing elements within a sentence which produce this complexity. One particular reaction-time measure, *priming*, allows the experimenter to distinguish between conscious, strategy-laden processing and unconscious, automatic processing, by systematically varying the time between the onset of the (first) prime word and the subsequent target word. Posner and Snyder (1975) were the first to show that when the target occurs less than 250 msecs. after the prime, one's response to the target is automatic. Although a 250-msec. break between the onset of the prime and the onset of the target word gives us enough time to read, understand, and respond to the target word, it does not give us enough time to consciously think about the meaning of that word—we respond automatically on the basis of already well-established semantic associations. However, when the time between the onset of the prime and target is greater than about 350 msecs., we have enough time to consciously ponder the old as well as new associations between the two words.

Using the priming technique, we will test the following hypotheses regarding the focalizing Who and other characters:

1. Where the distinction between the focalizing WHO and other characters is clear, a hierarchy of activation should exist such that the focalizing WHO will be most strongly activated in working memory, with the most central non-focalizing character somewhat less strongly activated and non-central, non-focalizing characters least activated.

2. The focalizing WHO should prime (or activate) other characters more than these characters prime each other.

3. Different deictic operations may require different types of narrative processing. E.g., establishing and shifting POV may require conscious processing strategies, whereas maintaining POV may be achieved automatically.

4. When several converging linguistic devices clearly mark the POV, there should be a high degree of certainty about the focalizing and/or focal (focused-upon) WHO. This should translate into a high degree of activation of the character who occupies the WHO. When linguistic devices conflict with regard to the POV, there should be a low degree of certainty and a low degree of activation of the WHO.

4 Linguistic Devices and Their Roles (David A. Zubin)

The primary linguistically oriented goals of this project are to identify and describe the linguistic devices that play a special role in the structuring of narrative comprehension and to clarify the particular roles that they play. We will concentrate on three aspects of these topics.

1. We will provide linguistically adequate descriptions of (a) cohesive devices in English which function to signal the presence of subjective context and to differentiate different types (Banfield 1982) of subjective contexts, and (b) cohesive signals which mark the *boundaries* of subjective contexts established by other means. While Banfield (1982) attempted such descriptions in the context of a generative (sentence) grammar, we propose to do so in the context of the DC theory of discourse structure and comprehension.

2. We will investigate the linguistic consequences of subjectivity for the space, time, and actor components of the DC. These consequences include: (a) deictic dissynchronization, specifically, the uncoupling of the actor component from the spatial or temporal center of the narrative and (b) the resolution of reduced anaphors.

3. We will identify and provide descriptions of subjectivity devices *of languages other than English*—devices ranging from aspect and mood marking on verbs to less familiar devices such as switch-reference marking, "topic" marking, and logophoric and "free reflexive" pronouns. Aside from the inherent linguistic value of assessing such devices in the context of DC theory, these descriptions will benefit other aspects of language research:

   (a) They will help to broaden the dimensions of the current research to a general theory of subjectivity in human language, rather than one based on subjectivity devices available in English. This will move our research closer to a cognitive theory of subjectivity: E.g., one problem in the general theory of subjectivity is the differentiation of types. Banfield (1982) has catalogued subjectivity devices in English and French to differentiate types. Pilot research of ours (based on Hyman 1979) shows that logophoric pronouns in Aghem (Bantu) may clearly differentiate between (i) represented speech and thought and (ii) represented perception (cf. §4.3).

   (b) They will provide a discovery procedure for the analysis of unclear subjectivity devices in English. Where aspects of English subjective context marking may be complex and indirect, another language may present a straightforward marking device. E.g., logophoric pronouns and "free reflexive" pronouns seem to directly mark the presence of an explicit or implicit focalizing WHO thinking/speaking about (him/her)*self*, rather than marking an objective ontological reference. No device in English directly renders this sort of reference(but cf. the work on quasi-indicators in Castañeda 1967, Rapaport 1986). Thus the analysis

of languages with such devices (see Appendix B) can help ferret out the indirect strategies by which this distinction is made in English narrative. We have already applied this cross-linguistic technique to the analysis of spatial terms in English (Zubin & Choi 1984).

4.1 Description of Cohesive Subjectivity Devices in English

Subjectivity (Sj) devices which we have identified in pilot research and/or in the literature are illustrated below. We propose to test the validity of these linguistic structures as Sj-devices by subjecting them to distributional analysis (Zubin 1979). (In the examples below, relevant Sj-devices are italicized, and subjective contexts are enclosed in braces.)

(a) **Tense/Aspect**. Tense shifts in narrative are correlated with the presence of subjective context, and may mark its boundaries:

(i) *past-present shift*: Adam *could* barely believe what his eyes *were seeing*: a naked couple *jumps* out of the taxi, *dashes* across the street right in front of him, and into the lobby of the hotel. His mouth *hung* open in sheer amazement.

(ii) *past-pluperfect shift*: Adam *paused* in front of the shop window. Somewhere he *had seen* an engraved locket just like the one in front of him. Yes, it *had been* around the woman's neck, the one who *had jumped* naked out of the taxi the week before. He *turned* the corner and *went* to the door.

(iii) *past–future-in-past shift*: Adam *paused* in front of the door. In just a moment he *would be* inside. He *would discover* the true owner of the locket, and his world *might be shattered*. He *hesitated* another moment before entering the shop.

Progressive aspect also contributes to the construction of subjective context (aspect is much more extensively exploited in other languages for this purpose; cf. §3, below):

(iv) *plain-progressive shift*: Adam *stood* in front of the showcase. The jeweler *was avoiding* the locket he had pointed to, *was showing* him irrelevant pieces of inconsequential junk. What was he afraid of? Adam's hand *began* to tremble.

(b) **Verba Dicendi** in combination with non-shifted tense and person "*indirect discourse*" form an Sj-device with the peculiar property of projecting the whole into the consciousness of *another* character:

(i) Adam was stymied. The jeweler said he wouldn't sell the locket, that he was saving it for another customer. Adam offered him more money.

Note that the whole bracketed context takes place within *Adam's* consciousness, and that his being stymied is a result of it. Compare the changes necessary to make the same context an objective one: direct quotation, reconstruction of the jeweler's actual words (including shifted person and tense, change in deontic modality), and inversion of the first and second clauses to their natural order of occurrence in the objective world of the narrative:

(ib) The jeweler said: "I'm sorry, I can't sell you the locket. I'm saving it for another customer." Adam was stymied. He offered him more money.

(c) **Subjective Predicates**. English (and every language) has classes of predicates that signal the subjective disposition of a focalizing WHO which may be cognitive (think, believe, feel, be afraid) or perceptual (see, hear, sense). Syntactic embedding (complementation) serves to mark the domain of the subjective context (i, iii) but is not necessary (ii, iv):

(i) Adam *thought* {(that) he could convince the jeweler to sell him the locket}, but the jeweler closed the case and put it away.

(ii) Adam *thought* quickly. {Maybe he could convince the jeweler to sell him the locket.} But the jeweler closed the case and put it away.

(iii) Adam *watched* {the jeweler putting the case away . . . }

(iv) Adam *watched* the jeweler. {He was putting the case away . . . }

There is an asymmetry between cognitive and perceptual predicates: while the cognitive ones almost inevitably evoke a clear subjective context, the perceptual ones less clearly do so. This corresponds to the (real-world) fact that a perceived scene is generally accessible to other observers (and therefore "objective"), while objects of thought and feeling are private. Thus, in (i), 'convincing the jeweler to sell the locket' is not part of the objective story world, but only of Adam's consciousness. In (iii), however, 'the jeweler putting the case away' is both in Adam's consciousness and available in the story world (objective). Under as yet unspecified conditions the content of subjective contexts is inherited to the story world.

In addition to predicates which directly signal these subjective dispositions, an open class of lexical collocations allow them to be inferred, creating an opening for subject context:

(v) Adam's *lip quivered*. {Couldn't the jeweler see how much the locket meant to him?} But the jeweler was oblivious.

(vi) Adam's *face reddened* and his *jaw set*. {This idiot was not going to stand in his way.}

Overt subjective predicates have been relatively well studied (especially with syntactic embedding), but the range of collocations with implicit subjectivity has yet to be determined.

(d) **Definiteness**. The article system of English serves a number of functions in English among which is the marking of knowledge states. The classical position, based on the speech-situation (interactional) model of language, states that the definite article marks a referent already identified by the *listener*, while the indefinite article marks one not yet identified or unidentifiable. In narrative, these values may be transferred to a focalizing WHO, thus placing the articles in the role of Sj-markers. In the following context, 'the boy' is a completely new character to the story world, and thus not yet identified by the reader.

(i) The door opened, and Adam turned to look. {There was standing *the little boy* who had helped him cross the street. He was beginning to cry.} The jeweler came from behind the counter . . .

Note the inference the reader makes: Adam already knows who this little boy is (a knowledge state marked by the definite article and explained by the relative clause), even though the reader and the jeweler do not. The next example illustrates the inverse of this effect:

(ii) As the woman left, the jeweler lifted the locket he had just bought from her to the light and looked at it admiringly. Then he placed it in the show window on a satin pillow and went back to his workbench.
Later that morning Adam paused in front of the jeweler's window on his daily walk. {There was *an engraved locket* just like one he had seen before . . . }

The locket does not mysteriously lose its definiteness when crossing the clause boundary. It is already known to the reader, and in the objective world of the narrative, to the jeweler. But it is a not-yet-identified object *to Adam* at the moment he sees it in the window, and this *subjective* knowledge state is marked by the indefinite article.

(e) **The Basic Level in Lexical Taxonomy**. Folk-taxonomic research (Berlin 1976, Rosch 1978) has identified an assymmetrical structure to the lexicon in which *basic level terms* are preferred over super- and subordinates for the everyday, unmarked identification of referents. Thus, the object one writes with may be identified as "an implement," "a writing instrument," "a pen," a "ball-point," or "a textured ball-point," although on most occasions in everyday communication speakers will use the term of intermediate specificity: *pen* (cf. our group's computational implementation in Peters & Shapiro 1987ab; Peters, Shapiro, & Rapaport 1988). In narrative, this is the level of specificity which has the most neutral, objective character in descriptions. Deviations from it tend to imply the presence of a particular perceiving consciousness (a focalizing WHO) whose special knowledge/information state motivates the deviation. E.g., folk taxonomic research has found that among the conditions motivating the use of superordinate terms is a *lack of information* on the part of the observer. In narrative, this lack is attributed to a character, creating a subjective context:

(i) Adam hurried along the street, glancing over his shoulder. {*A figure* was following him in the distance.} Adam's pace quickened.

Folk taxonomic research has also found that a specific, or subordinate level of description may become the basic level for specialists. What is a tree or a pine to the layman is a jack pine or "a jack" to the forester. In narrative, a highly specific level of description suggests the expertise, and thus the consciousness, of a particular character:

> (ii) As Adam left the store the jeweler began clearing away the various trays of lockets and brooches he had taken out, and then his hand froze. {The locket with the twelve-point oriental amethyst was not there.} Beads of sweat formed on his forehead.

Epithets form a third kind of (non-taxonomic) deviation from the basic level of description. The more evaluative an epithet is, the more likely it is to create a subjective context:

> (iii) The jeweler's face reddened with rage. {The *son-of-a-bitch* must have slipped the locket off the tray when the little boy came in.} He jumped for the phone to call the police.

In general, any shift away from the most neutral level of description of a referent will tend to enclose that referent in the subjective context of a focalizing character.

Finally comes the issue of what constitutes the basic level of referring in narrative for people. This is still an open issue, but there is a promising hypothesis which we intend to pursue. In interaction, it seems clear that a variety of choices for referring to "third" persons may be basic, depending on speech situation variables. To simplify immensely, in English, given high solidarity between S(peaker) and H(earer), a first name will be basic ('William'). Low solidarity implicates a last name ('Mr. Smith') or a descriptive term ('the jeweler'). A situation in which S and R(eferent) are kin-related, but S and H are not, implicates a possessed kin term ('my brother').

Thus, in interactional discourse, the basic term for a human R may take a variety of forms, depending on the social relations between S, H, and R. Folk-taxonomic theory predicts that any deviation from this basic term will correlate with marked knowledge states (e.g., S doesn't know R's name) or marked communicative circumstances (e.g., an introduction).

DC theory predicts an importation of this interactional schema into narrative discourse, thus creating in narrative the possibility of subjective context being signalled by a referring term which is "basic" to the specific relation between two characters. In (iv-a) the bracketed context is subjective to the jeweler, and the final 'he' refers to him, while in (iv-b) it is probably subjective to the policeman:

> (iv) A policeman arrived a few minutes later, and began questioning the jeweler about the missing locket.
>
> > (a) At that moment {*his wife* appeared from the back room. What was she doing here?} *He* frowned.
> > (b) At that moment {*a woman* appeared from the back room. What was she doing here?} *He* frowned.

NB: The precise onset of the subjective context is problematic in these cases, cf. §6 of the proposal.

(f) **Person**. Classical rhetoric distinguishes between direct and indirect discourse on the basis of such features as shifted vs. non-shifted tense and person. (Quotation marks are a relatively recent literary convention.) In narrative, there are a variety of options in which person is shifted with or without tense, creating differing types or degrees of penetration into the consciousness of the character:

> (i) direct speech: "What do you want from *me*?" the policeman asked.
> (ii) indirect speech: The policeman asked what she wanted from *him*.
> (iii) represented thought of varying types:
>
> > The policeman wondered {what she wanted from *him*}.
> > George was puzzled. {What did she want from *him*?}
> > George was startled. {What does she want from *me*?}

Other languages provide further options for mixing pronouns in represented thought in which the following is possible:

> (iv) George wondered {what do *you* want from *him*-log.}

Here, '*him*-log' is a "logophoric" pronoun indicating reference to the speaker, or the subject of represented thought. See the discussion of logophoric pronouns below in §3.

(g) **Syntactic relics of interactional discourse**. Non-shifted pronouns and tenses can be thought of as *relics* in subjective context of the transposition from interactional discourse to narrative in the sense that they are the basic forms occurring in interactional speech (cf. example (i) in (f) above). Other such relics signaling subjective context include the use of S-Aux inversion and the occurrence of sentence fragments:

(i) inversion: The jeweler glared at his wife. {*Wasn't she* a big help! *Didn't* she know the police might realize what was going on?} He waved her off with his hand and turned to the policeman.

(ii) fragments: Then his wife brought forth the real locket from her apron. The jeweler was ecstatic. {*What a beauty! That mounting and the perfect facets! How exquisitely conceived!*} His hand was moist with perspiration as he took it from hers.

(h) **Subjective adverbials**. An as yet to be determined range of adverbial expressions suggest the perceptions/thoughts of a specific consciousness, rather than objective view of events. Cf. the discussion of this type in Japanese in §3, below.

Adam glanced over his shoulder and his pace quickened. {Someone was *obviously* following him.}

(j) **Argument Structure**. Adverbs, conjunctions, and other devices indicating *reasoning or purposful connections* among events serve to filter those events through the consciousness of a focalizing WHO (or a narrator). Their effect is strengthed by placing the events in the text in *the order of reasoning*, rather than the order of narrative world occurrence.

(i) {Someone was obviously following him.} He suddenly turned the corner. The shadower was gone.
(ii) {Someone was obviously following him. He deliberately turned the corner *in order* to lose his shadower.}
(iii) {Someone was obviously following him. *In order* to lose his shadower, he deliberately turned the corner.} NB: inversion

In example (i), there is no indication of subjective context after the first clause. In (ii), the conjunction *in order to* suggests that Adam is reasoning about how to get rid of his follower, an effect which is heightened in (iii) by placing the description of his (antecedent) purpose before his (consequent) action. Note that in "real" narrative time, turning the corner precedes losing the follower, i.e., the reverse order. §6 of the proposal contains a more precise articulation of the issues surrounding argument structure.

4.2 Subjective Context and the DC

The second major goal of the linguistic component of this project is to investigate how the presence of subjective context interacts with the WHERE, WHEN, and other aspects of the WHO of the Deictic Center. These consequences include (a) deictic dissynchronization, specifically, the uncoupling of the actor component from the spatial or temporal center of the narrative, and (b) the resolution of reduced anaphors within and across subjective contexts. (Examples in this section are taken from Steinbeck's *The Pearl*, in a few instances with modifications to highlight structure.)

(a) **Deictic Dissynchronization**. A major finding in previous work of this project is that normally the WHO, WHEN, and WHERE of the DC move in synchrony. This means, for example, that a major shift in the WHERE will normally entail a shift to a different WHO, as in the following example:

(i) [Kino is at the gate of the doctor's house talking with the servant.] "A little moment," the servant said. "I go to inform myself," and he closed the gate and slid the bolt home. *In his chamber the doctor* sat up in his high bed. He had on his dressing gown . . .

In (i), the preposed PP indicates a shift to a new WHERE, accompanied by a shift to a new WHO. This synchronization, or conventional coupling of person and place, makes it possible for a shift in WHERE to invoke a shift to a different WHO without actually referring to the character:

(ii) [doctor to servant] "See if he has any money!" *At the gate* the servant opened the door a trifle and looked out at the waiting people. And this time he spoke in the old language. "Have you any money?"

This question, of course, is directed at Kino, the WHO associated with the WHERE of the gate scene, even though he isn't overtly mentioned. The reader can thus depend on the conventional coupling of WHO, WHEN and WHERE in order to make inferences about a shift in one of these components, given a shift in another.

There is a class of context types, however, in which this convention is broken. We hypothesize that a significant subset of this class is made up of instances in which a shifted WHERE or WHEN is in the subjective context of a focalizing WHO. In the next example, Kino is hiding by the side of the road to see if he and Juana are being followed:

> (iii) And then he saw them moving along. *In the distance* he could see three figures, two on foot and one on horseback. Even *in the distance* he could see {the two on foot moving slowly along, bent low to the ground. *Here*, one would pause and look at the earth, while the other joined him. *Here*, he and Juana might have stepped out of the wheel rut, and these people could follow. Behind them, on a horse, was a dark man, his nose covered with a blanket.}

Note the contradiction between the spatial deictic specifications 'in the distance' and 'here'. In particular, 'here' is *not* where Kino, the focalizing WHO is. In this example, we have a focalizing and a focalized WHO, and two WHERES: one for Kino, and one for the objects of his subjective context. In other words, the subjective context, conceptually embedded within the consciousness of the character as it is, can have its own WHERE, controlling deictic terms such as *here*, *come*, and *bring*. This subjective space can also have its own WHEN:

> (iv) The doctor thought of Paris. He remembered (1) {the hard-faced woman who had lived with him as a beautiful and kind girl,} although she had been none of these three. The doctor looked past his aged patient and saw (2) {himself sitting in a restaurant in Paris and a waiter was just opening a bottle of wine.}

Subjective context (1) contains an explicit marker of time shift (had lived), which however does not shift the WHO, since it occurs within a subjective context of the current focalizing character. Context (2) contains no marks of time shift, and yet the events are still inferred to occur within the WHEN and WHERE of the continuing subjective context. Note that the subjective context allows 'himself', a bound anaphor, to be coreferential with its syntactically required antecedent 'the doctor', even though the "self" the doctor conceives at the WHERE and WHEN of the subjective context is very different from his "self" of the current, objective narrative WHERE and WHEN. In general, we hypothesize that the conceptual embedding of a subjective context within the consciousness of a focalizing WHO in the objective story world will allow the establishment of two WHEREs and two WHENs, and yet leave the WHO unshifted. This hypothesis is developed in useful form and considerable detail in Fauconnier (1985).

(b) **Reduced Anaphor** within and across subjective contexts. There is already a great deal of literature on the resolution of reduced anaphors within linguistic, psychological, and computational approaches, and from syntactic (e.g. Reinhardt 1983, Caramazza & Gupta 1979) and pragmatic (e.g. Givon 1983, Marslen-Wilson et al. 1982) theoretical viewpoints. Among the primary strategies proposed for anaphor resolution are morphological cues, syntactic binding (Reinhardt 1983), textual recency (Hobbs 1976), parallel function (Caramazza & Gupta 1979), topic continuity (Givon 1983), focus (Reichman 1978, Sidner 1983) and pragmatic matching (Marslen-Wilson et al. 1982). See Li & Zubin 1986 for an overview of these.

The least articulated of these proposals is pragmatic matching. Givon (1983) briefly mentions it as "thematic continuity" before turning to more tractable matters. Marslen-Wilson et al. (1982) assert that all instances of reduced anaphor in their protocols could be resolved by picking the pragmatically most "probable" participant in the episode, but offer as a specific strategy only the suggestion that particular participants be matched to particular event types, and offer no principles or rules for doing so.

We hypothesize that a significant subset of unbound (cross-sentence) anaphors will be resolved through the prior establishment of the boundaries of subjective contexts. Two specific hypotheses depend on the fact that in many subjective contexts the WHO has been split into a focalizing and a focalized WHO.

Hypothesis (1): a reduced anaphor within objective context will (tend to) refer to the focalizing WHO, while one within subjective context will (tend to) refer to the focalized WHO. This hypothesis is supported by the fact that some languages (see sect 3e,f) have a distinctive pronoun for the exceptional case in which a pronoun in subjective context refers to the focalizing WHO.

Hypothesis (2): the event types that the focalizing WHO will (tend to) participate in will be subjective dispositions, while the focalized WHO will (tend to) participate in objectively observable states and activities. This, of course, is the simple case. It does not account for recursive embedding of subjective context, e.g. A thinks about B looking at C.

Pilot data suggest the viability of these two hypotheses. In example (i) there is a focalizing and a focalized WHO with alternating subjective and objective context. Both WHO's are referred to with the pronouns he/him/his:

> (i) [Juan and Kino are hiding in a cave. Kino is preparing to sneak up on a group of trackers who are following them. NB: "Juana" in the original has been changed to "Juan" in order to remove the influence of gender as a morphological cue.]
>
> 1 Against the sky in the cave entrance Juan could see that –{Kino was
> 2 taking off his white clothes, for dirty and ragged though they were
> 3 they would show up against the dark night. *His* own brown skin was
> 4 a better protection for *him*.}– And then *he* saw how –{*he* hooked
> 5 *his* amulet neck-string about the horn handle of *his* great knife,
> 6 so that it hung down in front of *him* and left both hands free.
> 7 *He* did not come back to *him*. For a moment *his* body was black in
> 8 the cave entrance, crouched and silent, and then *he* was gone.}–
> 9 Juan moved to the entrance and looked out.

This passage is primarily subjective context, with short pieces of objective context in lines (1), (4) and (9). All the pronouns in objective context refer to Juan, the focalizing WHO, while those in subjective context refer to Kino, the focalized WHO, with the exception of *him* in line (7). Otherwise, pronominal reference can be entirely resolved through the subjective context strategy. NB: the exceptional occurrence of *him* in line (7) is precisely the context type in which in other languages logophoric pronouns and "free reflexive" pronouns provide morphologically disambiguating cues. See §§3e, 3f.

Furthermore, the predicates associated with the anaphoric pronouns in question sort into objective events and subjective dispositions. Kino is the intended participant in *overt activities* (take off, cf. line 2; hook, 4; be gone, 8); in *states* (be in front, 6) and in *possession* of physical characteristics (brown skin, 3; knife, 5; body, 7). Juan is the intended participant in *perceptual dispositions* (see, 1; see, 4; look, 9) and, exceptionally, in an activity (move, 9). This activity, however, is preparatory to a perceptual disposition.

In the next example (unchanged from the original) there are a total of ten reduced anaphors: six occurrences of 'they/them' and four occurrences of zero anaphor (#), each one of which could be resolved to the beggars or the women on the basis of morphological and syntactic criteria:

> (ii) The four beggars in front of the church knew everything in the town. *They* were students of the expressions of young women as *they* went in to confession, and *they* saw *them* as *they* came out and # read the nature of the # sin. *They* knew every little # scandal and some very big # crimes.

The passage is a rapidly alternating sequence of objective and subjective context. The following schematic rendition separates it into the two context types. Note that the subjective contexts on the right are all syntactically governed by subjective predicates in matrix clauses on the left. This is a particularly strong form of subjective context boundary marking.

objective context	*subjective context*
1 The four beggars knew	everything in the town
2 *they* were students of	the expressions of young women as *they* went in to confession
3 *they* saw	*them* as *they* came out
4 # read	the nature of the # sin
5 *They* knew	every little # scandal and some very big # crimes.

All reduced anaphors in objective context refer to the beggars (the focalizing WHO), and those in subjective context refer to the women. Furthermore, the beggars are consistently the agents of subjective dispositions (*know*, *see*, *read* (in sense of "glean information about", and *be students of* (in the sense of "perceive and ponder"); while the women are the objects of these dispositions, or associated with activities as agents (go, come) or possessors (sin, scandal, crime). Thus the two hypothesized factors—being in the scope of subjective vs objective context, and being associated with

subjective vs non-subjective predicates—are in agreement with each other, and are reliable cues for resolving the reduced anaphors in this passage.

4.3 Sj-Devices in Languages Other Than English

The third major goal of the linguistic aspects of this project is to identify and provide descriptions of Sj-devices in languages other than English. A number of insights to be gleaned from these sources have value to the overall computational and cognitive goals of this project in ways that were described in the introduction to this section. It is surprising that these insights are to be gleaned not only from so-called exotic languages unrelated to English, but also from sister languages in the Romance (French) and Germanic (German, Icelandic) subfamilies of Indoeuropean.

The possible range of Sj-devices has yet to be determined. Some, such as the use of superordinate and subordinate nouns, is available in all languages, although it may not be exploited in narrative discourse. Others, such as the use of definiteness marking, are limited to those languages which possess the specific morpho-syntactic properties. We will focus here on morpho-syntactic Sj-devices not avaiable in English. These include (a) *aspect* in French (Reid 1978, Banfield 1982), (b) *mood* in Islandic (Sigurdhsson 1986) and German, (c) *topic marking* in Japanese (Kuroda 1973, Kuno 1986, Zubin & Watanabe 1989), (d) *switch-reference marking* in Papua New Guinea languages (Roberts 1987, 1988) and Amerindian (Dahlstrom 1982), (e) *logophoric pronouns* in Niger-Congo (African) (Hagege 1974, Clements 1975, Hyman 1979, Hyman & Comrie 1981, Sells 1987) and (f) *"free reflexive" pronouns* in Japanese (Kameyama 1984, Kuno 1986, Sells 1987), in Icelandic (Sigurdhsson 1986, Sells 1987), and in German.

(a) **Aspect marking**. A morpho-syntactic property of many diverse languages (but not English) is the distinction between perfective and imperfective aspect, conveying (roughly) a distinction between events viewed as unitary, completed wholes, and events which are ongoing, durative, or habitual. In narrative discourse, this distinction has been shown to convey a distinction between background (e.g., scene description) and foreground (narrative line), by a number of researchers (Weinrich 1964, Reid 1979, Hopper 1979).

French narrative discourse has available the distinction between perfective (passe simple) and imperfective (imparfait) tenses which, as an extention of their fore-backgrounding use, are exploited to differentiate subjective from objective context (Reid 1979, Banfield 1982). The following narrative passage from Flaubert's *Madame Bovary* is quoted from Reid. The close translation follows the French almost word for word, and distinguishes the relevant verbs as *perf* and *imp*. The free translation reveals alternative Sj-devices that must be substituted in English.

> (i) [Rouault has just married off his daughter and sends the couple off in his carriage. He reminisces about his own wedding day, initiating a subjective context.]
>
> 1 (Le père Rouault) *s'arrêta*, et, comme il *vit* la carriole
> 2 s'éloignant . . . il *poussa* un gros soupir. Puis il se *rappela* ses
> 3 noces . . . Il *était* bien joueux, lui aussi, le jour qu'il
> 4 l'avait emmenée de chez son pére dans sa maison, quand il l'a *portait*
> 5 en croupe en trottant sur la neige . . . elle le *tenait* par un
> 6 bras; à l'autre *était* accroché son panier . . . lorsqu'il *tournait*
> 7 la tête, il *voyait* pres de lui . . . sa petite mine rosée qui
> 8 *souriait* silencieusement . . . Comme *c'était* vieux, tout cela! . . . Alors
> 9 il *regarda* derrière lui, il *n'apercût* rien sur la route.

Close translation:

> 1 (Father Roualt) *stopped-perf* and, as he *watched-perf* the carriage
> 2 vanishing . . . he *gave-perf* a deep sigh. Then he *remembered-perf* his
> 3 wedding . . . --{He, *was-imp* very happy, him too, that day on which he
> 4 had taken her from her father's to his (own) house, when he *carried-imp*
> 5 her behind (him) riding through the snow . . . She *held-imp* him with one
> 6 arm, in the other *was-imp* clutched her basket . . . When he *turned-imp*
> 7 his head he *saw-imp* close to him . . . her little rosy countenance which
> 8 *smiled-imp* silently . . . How long ago it *was-imp*, all that!}– . . . When
> 9 he *looked-perf* behind him, he *didn't see-perf* anything on the road.

Free translation:

> The elder Roualt stopped and sighed deeply as he watched the carriage vanishing in the distance. And then he remembered his own wedding. –{He, too, had been very happy, that day when he had taken her from her father's house. She had ridden behind him on the horse through the snow. She had held onto him with one arm, and to her basket with the other. When he had turned his head he had seen her close to him, her rosy cheeks smiling silently. How long ago it had all been!}– And now, when he looked behind him, he could no longer see anything on the road.

The French text uses perfective verbs up to the initiation of the subjective context in line 2, marked by the verb 'remember'. As the text enters Roualt's subjective remembrance, it shifts to the imperfect "tense" and maintains this consistently until the end of the subjective context, when it returns to perfective aspect. Other Sj devices supporting the shift are the adverbs *puis* in line 2 and *alors* in line 8; the pluperfect in line 4, and the exclamatory sentence in line 8.

In the French, there is no directly-signaled time shift, but rather a signaled shift into subjective context and out again. The reader of course can *infer* the time shift from the fact that the subjective context is a rembrance. This effect in the free English translation must be rendered by the pluperfect tense ('had been', etc.) directly signaling a backward shift in time from the narrative NOW, from which the continuation of the subjective context can be inferred. The difference is that the French text is able to maintain deictic continuity within the subjective context, while the English translation repeatedly signals a shift-back in time, thereby breaking up its deictic continuity. In consequence, the English translation makes it more difficult for the reader to "experience" the content of the subjective context.

(b) **Mood**. A number of languages use the subjunctive mood to mark the content of a subjective context. Icelandic (Sigurdhsson 1986) and German will serve as examples:

1 Formadhurinn *vardh* oskaplega reidhur.
2 Tillagan *vaeri* avivirdhileg.
3 *Vaeri* henni beint gegn ser personulega.

1 the-chairman *became-indic* furiously angry.
2 The-proposal *was-sjnct* outrageous.
3 *Was-sjnct* it aimed at him personally.

Line 1 is an objective external description of the chairman's affect, and the verb is in the indicative (indic) mood. The following two sentences report the content of his subjective disposition, and thus constitute a subjective context, which is distinguished from the objective opener by the subjunctive (sjnct) mood.

A similar effect is achieved in German through the use of the present subjunctive mood, used in interactional discourse for inderect reports of other's speech. In narrative, it has the effect of filtering the speech of one character through the consciousness of another. In the following example, Adam is the focalizing WHO, through whose consciousness we experience the content of the refugee's utterances, and the subjectivity of this context is marked by the present subjunctive:

1 Adam *hoerte* dem zerstreuten Fluechtling zu.
2 –{Er *habe* nicht die geringste Ahnung, warum man ihn *verfolge*.
3 Er *sei* aber bereit, aufzugeben.}– Adam *merkte*, wie er dabei *zitterte*

Close translation:

1 Adam *listened-indic* to the distracted refugee.
2 –{He *have-sjnct* not the slightest idea, why one *persecute-sjnct* him.
3 He *be-sjnct* however ready to give up.}– *Adam noticed-indic* how he *shook-indic* thereby.

Free translation:

> Adam listened to the distracted refugee. –{The poor guy didn't have the slightest idea why he was being persecuted. Now he was ready, however, to give up.}– Adam noticed how he shook as he spoke.

Note that the German text directly marks the subjective context as part of Adam's consciousness, while the English translation has to resort to lexical Sj-devices ('the guy', 'now') and progressive aspect ('was being persecuted') to achieve a parallel effect.

Shifting the subjunctive verbs back to the indicative mood in German eradicates the subjective context and raises the content of the refugees' utterances onto the objective plane of the narrated world. In the process, the adverbial *dabei* referring to the refugee's act of utterance becomes inadmissable:

1 Adam *hoerte* dem zerstreuten Fluechtling zu. –{Er *hatte* nicht
2 die geringste Ahnung, warum man ihn *verfolgte*. Er
3 *war* aber bereit, aufzugeben.}– Adam *merkte*, wie er ()dabei *zitterte*.

Adam listened to the distracted refugee. He didn't have any idea why he was persecuted. He was ready, however, to give up. Adam noticed that the refugee was shaking.

(c) **Topic Marking**. Topic marking in topic-prominent languages such as Japanese and Korean serves a broad variety of functions (Watanabe 1989), some of which relate directly to maintenance and shift of the DC (Zubin & Watanabe 1989). Spatial and temporal adverbials which shift the WHERE and WHEN of the DC, e.g., are consistently topic-marked in Japanese. The marking of participants is more complex, with *wa* "topic", *ga* "subject", and a series of other case markers available. In objective contexts, a focalized WHO is likely to be marked for topic (wa), although there are other strategies motivating the use of subject marking (ga). In subjective contexts, however, the focalizing WHO must be marked with *wa*. The following passage from a children's story (analysed in Zubin & Watanabe 1989) illustrates this effect. (For reasons of space, the text is given in an English translation which follows the Japanese closely in aspects relevant to the issue. Japanese generally uses zero anaphor rather than pronouns. Where necessary for clarity, pronouns in parentheses are added. In these places, the Japanese original simply has nothing.)

[Three Friends, Baby Fox, Baby Bear and Baby Rabbit find a swinging bridge over the river. Baby Fox is told a baby girl fox lives on the other side, but he is afraid to cross. At first, none of the three characters dominates the story, but then in this passage Baby Fox emerges as a focalizing WHO:]

1 "I want to see the girl fox," *Baby Fox GA* said. . . . Looking at
2 the other side of the bridge, *Baby Fox GA* stood on his toes. . . .
–he goes home–
3 –{"over there lives a baby fox"}– That night after going to bed
4 *Baby Fox WA* was talking (himself). –{"(I) want to visit there. (I)
5 wonder if (I) should try."}– (He) opened (his) eyes wide in the dark.
6 –{"Swaying, swaying, and I. . . " In the darkness the hanging bridge
7 emerged, and an image of (him)self crossing it seemed to emerge.}–
8 *Baby Fox WA* quickly closed his eyes.
9 The next morning *Baby Fox GA* came to the foot of the bridge.

Note that in the episode prior to the subjective context (lines 1 & 2), Baby Fox, marked with *GA*, talks and engages in activity, but the reader does not enter his consciousness. In line 3, we begin to share his private experience, and he is marked with *WA*, in lines 4 and 8. In line 9, the text shifts back to an objective description and the case marking goes back to *GA*. Thus, the alternation between *WA* and *GA* is associated with movement into and out of subjective context.

The *GA*-*WA* alternation has a further function within subjective contexts. As seen above, the focalizing WHO must be *WA*-marked. The object of the focalizing WHO's thought or perception, however, may be marked either way, depending on whether it is already present in the WHO's consciousness (expected, "given information") or whether it enters at that point (unexpected, "new information"). (Cf. Kuroda 1973 for a close antecedent to this hypothesis.) In this respect, the focalizing WHO is an analog of the speaker in interactional discourse, where *GA* marks "new" subjects and *WA* marks "given" ones (Kuno 1986). The following passage illustrates this effect:

[Baby Fox is sitting on the bridge thinking about, waiting for the girl fox]

1 *Baby Fox WA* stopped playing the harmonica, and was about to doze.
2 –{"Fox Kit" It seemed *someone GA* was calling to (him) from somewhere.}–
3 *Baby Fox WA* became alert and looked at the far side. –{The bamboo
4 stand, the forest, the foot of the mountain … No matter how hard (he)
5 tried to see, *the figure of a baby girl fox WA* was not to be found.
6 "Fox Kit" *the voice WA* came from behind him. (He) turned around to
7 find that *Baby Bear and Baby Rabbit GA* were standing at the foot of
8 the bridge.}– "Hello. I'm coming back." *Baby Fox WA* stood up and
9 waved (his) hand.

First of all, Baby Fox as the focalizing WHO is consistently *WA*-marked in lines 1, 3, and 8. He hears a voice, he thinks it might be the girl fox, but it turns out to be his friends. In line 2, the voice first enters his consciousness, motivating the *GA*-marking on 'someone'. Since the girl fox is now already in his consciousness, 'figure of a baby girl fox' is *WA*- marked in line 5, as is 'voice' in line 6. The presence of Baby Bear and Baby Rabbit, however, is a new and surprising circumstance for him, and so they are *GA*-marked in line 7. To summarize, *GA* marks entities as they enter the focalizing WHO's conscious, while *WA* marks them once they are focalized. Note that in the objective narrative world 'someone', 'figure', 'voice', and 'Baby Bear and Rabbit' all count as referentially equivalent. Yet the pattern of *WA*-*GA* marking suggests that the final NP is referentially distinct, which is true only in Baby Fox's experience of the narrated world.

(d) **Switch-Reference Marking**. Languages from a number of diverse geographic areas (Haiman & Munro 1983) use markers to signal whether the subject of the *following* clause is going to be the same (SS) or different (DS) from the present clause. In the following examples from Amele, a Papua New Guinea language, the subjects of the two clauses in (i) refer to the same person, while in (ii) they refer to different people (*SS* = upcoming subject stays the same; *DS* = upcoming subject changes):

i. Ija hu-*mig*, sab j-ig-a
I come-*SS* food eat-I-past
"I came-SS and ate the food"

ii. Ija ho-*comin*, sab ja-g-a
I come-*DS* food eat-you-past
'I came-DS and you ate the food"

But recent research (Roberts 1987, 1988) shows that the switch-reference marking system is used to signal a variety of deictic shifts, including time and place, and may signal movement into and out of subjective contexts in narrative, as suggested by the following example:

iii. Cois eu mado-*comin* l-*ig* eh-*i* l-*i* mihigen do-n

Ok that I-say-*DS* I-go-*SS* take-*SS* go-*SS* put-I-you-future said-he
1 2 3 4 5 6

"Ok I-DS say that {I will go-SS take-SS you and go-SS give you to him,}" he said.

Note that moving between verbs 1 and 2 there is a DS marker, even though the subject stays the same. The shift is into the context of an indirect discourse. The shift out of this context between verbs 5 and 6 is marked by tense shift, apparently an even stronger deictic device than DS marking.

Dahlstrom (1982) reports the same phenomenon in Lakhota, a language of the Sioux Indians of North America. The marker *na* has been analyzed as the SS marker, and *yukha* as the DS marker (Chafe 1976). But the following example (iv) shows that the DS marker is used with no shift in subject when the text enters a possibly subjective context (the othography has been simplified for typographic convenience, and nasalation is not marked):

iv. mazophiyeta wa'i *yukha* chuwe wablake, chuwe leye lechi taktokanuha he

store-to I-go *and-DS* {sister I-see sister say here what-you-do Q}

"I went to the store and-DS saw {my sister, she said what are you doing here?}"

Note that following the DS-marked conjunction comes a report of the speaker's perception, i.e. "I went to the store and-DS what I experienced was {my sister saying: what are you doing here?}." This is clearer in the next example from Lakhota, which has both change in subject and entry into a subjective context:

v. [The male character is on a journey and comes upon a tent. The woman in the tent serves him food and puts him to bed.]

wana	kyul	xpayaha	*yukha*	ugna	winuxchala	ki	"yu,yu"	eyaha
now	down	lie	*and-DS*	{suddenly	old-woman	the	"yu yu"	say}
chake	shina	el	oxloka	wa	eta	eyokas'i	*yukha*	winuxchala
and-so	blanket	in	hole	a	from	peek	*and-DS*	{old-woman
k'u he e cha	hu	ki	gluk'eghahi					
it-was-she-that	leg	the	scratch}					

"Now he was lying down and-DS {suddenly the old woman was moaning} and so he peeked through a hole in the blanket and-DS {it was the old woman who was scratching her leg.}"

There are two subjective contexts, first a report of what he hears and then of what he sees. The fact that the man's head is covered during the first experience and that he peeks through a hole in the blanket during the second suggests strongly that the events are in fact being presented through his consciousness.

(e) **Logophoric Pronouns** are a morpho-syntactic feature widespread among languages of Africa (Hagege 1974, Clements 1975, Hyman 1979, Hyman & Comrie 1981, Sells 1987). A logophoric pronoun refers to a participant "whose speech, thoughts, feelings, or general state of consciousness are reported or reflected in a given linguistic context" (Clements 1975: 141). It characteristically occurs in contexts of indirect discourse such as the following in Ewe (Clements 1975). (The logophoric pronoun has been glossed as "self" to yield an interpretable English translation. It does not, however, have the distribution of a reflexive pronoun. A number of phonological features, including implosion of consonants, nasalation and height of vowels, and tone of syllables have been left out for typographic conveniences. This does not affect the issue under discussion.)

i. Kofi be *ye*-dzo
Kofi say *self*-leave
"Kofi said he (Kofi) left"

ii. Kofi be *e*-dzo
Kofi say *s/he*-left
"Kofi said he (someone else) left"

However, the logophoric pronoun is limited neither to contexts of reported speech nor to syntactic embedding, as shown by the following examples (from Clements 1975):

iii. from Ewe:
e-wo susu be {*ye*-a-yi afe ne *ye*-a-va ya-tu xo}
he-mak mind that {*self*-tns-go home so-that *self*-tns-go build house}
"He made up his mind that {he would go home to build a house}"

iv. from Ewe (Anlo dialect):
1 *Wo* ame etoa *wo*-dui vevie be {*ye*-woade dyinua toa me.
2 Ne *ye*-wodii toa me ko a, *ye*-woakoe woano yewo nguto *yewo* si,
3 ale be woano didim na *yewo* ghesiaghi le za me. Ne za do ko a,
4 dyinu didim na *yewo*, ke vivityi mega dodoge na *yewo* gheadekeghi o}.

Close translation:

1 *they* three *they*-planned firmly that {*self*-take out moon from water.
2 When *self*-had taken it outof water, *self*-lift it, it be *self*'s,
3 so that it shine for *self* always in night. When night fall,
4 moon shine for *self*, and darkness not come again for *self* ever}.

Free translation:

The three of them resolved that {they would take the moon out of the water. When they had taken it out of the water they would lift it up to make it their own, so that it would shine for them always in the night. When night came the moon would be shining for them, and darkness would never fall on them again.}

In (iii), the logophoric pronoun refers to the focalizing WHO of a cognitive disposition; i.e., no speech is involved. In (iv), logophoric pronouns are used extensively in non-syntactically embedded contexts. Thus, logophoric pronouns in Ewe seem to be an Sj-device directly marking the presence of subjective context.

Note that pronouns referring to the focalizing WHO in non-subjective context are non-logophoric: *e*- 's/he' in (iii) and *wo*- 'they' in (iv). The alternation between plain and logophoric pronouns may thus in addition serve to mark subjective context boundaries. This is explicit in (v):

v. from Aghem (Hyman 1979). Phonological simplification for typographic reasons.

[a man has run off with another woman, who then leaves him when she finds out he has a family]

1 nungo te fi dansi zigha tin no *'win*, zigha ma?a etsugho.
2 Wu vy ng'ka? tsugho ale'king ji alebuo ebam an'dugho.
3 Tu 'kin dila ni'a – *e* si buo tsigha nia enzila mo a mo mbang nung'o,
4 *ghe* tom kima?so a wi ni'a *e* lo kon buo yo ebam,
5 ni'a wi nizi *ghe'e*? *e* si ezing tso kon ndu tsigha nia ndu enzila? –
6 *o* ng'ka? tsugho lo?o la?'a kang wo . . .

Close translation:

1 woman that there then left forever *him*, left threw down.
2 person the started down to-look-for way to-come back to-house.
3 head heavy that –{*self* come pass enter how when indeed go,
4 *self* write letter to wife that *self* again come not back,
5 that wife forget *self*? *Self* now again go pass enter go how?}–
6 *He* started down places wandering around hither . . .

Free translation:

The woman then left him forever, abandoning him. The person started to figure out a way to come back home. He was ashamed that –{how could he return when he had written a letter to his wife that he would never come back, that his wife should forget him? How was he to come back now?}– He began to wander all around . . .

In the objective context of line 1, the plain pronoun *'win* 'him' is used. As soon as the subjective context begins in line 3, however, the logophoric pronouns *e* and *ghe* are used. The end of the subjective context at the beginning of line 6 is marked by, among other things, the plain pronoun *o* 'he'.

(f) **"Free Reflexive" Pronouns**. An extremely widespread phenomenon in the languages of the world is the use of reflexive pronouns outside of their "normal" binding contexts, a use that does not occur in English. In both (i) and (ii), the English reflexive pronoun must be co-referential with the subject of the immediate clause:

i. Bill pointed the pistol at himself (= Bill).
ii. Adam watched in horror as Bill pointed the pistol at himself (= Bill).

But in German the reflexive is "freer" in the sense that it may be co-referential with a participant in a higher clause, provided that that participant is a focalizing WHO. In (iii), the reflexive pronoun *sich* can be coreferential with either Adam or Bill:

German:

iii.	Adam	sah erschrocken zu,	{wie	Bill	die	Pistole	auf	*sich*	richtete}.
	Adam	watched shocked	as	Bill	the	pistol	at	*self*	pointed.

Adam watched in horror, as {Bill pointed the pistol at himself/him}.

Such usage in Latin is known to traditional grammarians as the "indirect reflexive", as in (iv) from Cicero, quoted from Klenin (1975):

iv.	Vos	ex	M. Favonio	audistis	Clodium	*sibi*	dixisse	…	periturum	Milonem
	you	from	Favonio	heard	Clodius	to-*self*	to say		to be dead	Milo

You heard from M. Favonius that Claudius said to him-refl (= Favonius) that Milo was to die.

In other languages, the reflexive pronoun is even freer (Sells 1987) and becomes a general Sj-device in subjective contexts, as shown by the following example (v) from (Sigurdhsson 1986):

Icelandic:

v.	Formadhurinn	vardh	oskaplega	reidhur.	–{Tillagan	vaeri	avivirdhileg.
	the-chairman	became	furiously	angry.	The-proposal	was	outrageous.
	Vaeri	henni	beint	gegn	*ser*	personulega.	
	was	it	aimed	at	*self*	personally.	

The chairman was furious. {The proposal was outrageous. Was it aimed at him-refl personally?}

Here the reflexive pronoun has no syntactic conditions on its occurrence at all. The primary criterion for its use is that it be in a subjective context, and co-referential with the focalizing WHO.

The reflexive pronoun in Japanese behaves in similar fashion (Kameyama 1984, Kuno 1986):

Japanese: TM = topic marker, SM = subject marker, OM = object marker.

vi.	Taroo	wa	totemo	kanasigatteita.	–{Yosiko	ga	Takasi	ga	*zibun*	*o*
	Taroo	TM	very	sad-was-being	Yosiko	SM	Takasi	SM	*self*	*OM*
	hihansita	noni	bengosinakatta	kara	da.}–					
	criticized	though	defend-did-not	because	be					

Taroo was feeling very sad. {It was because Yosiko, though Takasi criticized him-refl (= Taroo), did not defend him.}

In addition to the reflexive pronoun *zibun*, several other Sj-devices support the reader in constructing the subjective context. These include the progressive marker *-tei-* on the verb 'to be sad'; the topic marker *WA* on Taroo, the focalizing WHO; and the subject marker *GA* on Yosiko, the focalized WHO in Taroo's subjective context. See the discussion of topic marking as a Sj-device in (c) above.

As Sj-devices, free reflexives and logophoric pronouns are essentially parallel in function; the primary difference is their differing grammatical sources: the former as a clause-internal bound variable, the latter as a referential pronoun in quotative contexts. Reflecting these sources, there are number of specific restrictions on the distribution and semantic interpretation of these pronoun types, which are described in Clements 1975, Hyman & Comrie 1981, and Sells 1987. What specific consequences these restrictions may have for the use of free reflexive and logophoric pronouns as Sj-devices constitutes one of the problem areas to be addressed in the research.

4.4 Summary

In this section, we have outlined and provided pilot data for a set of hypotheses concerning the range of morpho-syntactic structures which appear to take on the function of Sj-devices. These hypotheses deliniate the types of structure which are likely to serve as Sj-devices in English and in other languages; they deliniate the specific means by which these devices signal the presence of and the boundaries of subjective context; and they make specific predications about how these devices interact with the other components of the DC.

5 Literary and Hermeneutic Issues (Mary Galbraith)

In current theories of literary interpretation, subjectivity is a watershed issue between those who consider subjectivity to be an outmoded concept and those who consider subjectivity to be a cause worth fighting for. The theory of narrative understanding which we are developing takes a unique stance toward the issue of subjectivity. Our theory is being built on the behavior of deixis in narrative. Deixis and subjectivity are closely intertwined topics. Russell claimed that the language of physics lacked deixis ("egocentric particulars") (Russell 1940: 108):

> Physics views space-time impartially, as God might be supposed to view it; there is not, as in perception, a region which is specially warm and intimate and bright, surrounded in all directions by gradually growing darkness.

Benveniste's argument that subjectivity is a product of language is built on the evidence of deixis. He claims that the word "I" creates subjectivity, rather than vice versa (Benveniste 1970). Ricoeur (1974: 256) uses similar evidence to reach the opposite conclusion, that deictic words demonstrate how personhood overflows language as a closed system:

> *I* and *you* as empty signs are creations of language; but the *hic et nunc* use of this empty sign through which the vocable *I* becomes a signification and acquires a semantic value supposes the appropriation of this empty sign by a subject who posits himself in expressing himself.

And Lyons (1982) leaves the question up in the air in his significantly titled article, "Deixis and Subjectivity: *Loquor, ergo sum?*" (I am speaking, therefore I am?)

Our own theory of deixis in narrative takes advantage of the insights of the structuralists about the absence of a speaker in literature (cf. §3.2); at the same time, it embraces the phenomenologists' recognition of selfhood, intentionality, and experience as central to the nature of reading and narrative (cf. §§6 and 7). We develop these ideas, using Bühler's (1934) theory of the deictic field in oral narrative, Hamburger's (1973) theory of the deictic field in fiction, Banfield's (1982) theory of the separation of SELF from SPEAKER in literature, and Kuroda's (1973) notions of reportive versus non-reportive attributions of internal experience in fiction. What all these theories have in common is the notion that the deictic field can separate itself from the act of utterance and be recreated at the level of a story world. This notion has far-reaching consequences which we are exploring in many areas of this project. In building on this tradition, we are creating an important alternative theory of narrative comprehension which provides insights missing in other theories, and which deserves to be considered widely by philosophers, literary theorists, psychologists, and cognitive scientists.

The following projects will be undertaken in order to develop an adequate theory of the functioning of deixis in narrative:

1. The different frames or levels within which the deictic field can operate must be specified: Our theory implicitly contains the notion of different cognitive levels, each with its own possible set of deictic coordinates (HERE/NOW/SELF). For example, we talk about the nesting of one subjective context within another, reader PUSHes and POPs, intra-fictional and extra-fictional sense-making, the story-world level versus the level of narration. The metaphor underlying these terms is either that of a hierarchically ordered stack or a series of nested frames. (For example, we say that when a reader cannot make sense of the logic of a story, she may POP out of the story-world frame to look for extra-fictional explanations for her problem.) We believe that, although many levels or frames are in some sense "present" at all times in the reading of narrative—the story level, the level of narration, the text/reader level—the reader can only foreground and "occupy" one level (and thus one deictic field) at any given instant.

2. The notion of "the immersion principle" will be developed: In order to account for the functioning of deixis in narrative, we have postulated some heuristics which seem to constrain the writing of narrative, and which a reader must cooperate with in order to "enter into" a story. One such heuristic is the immersion rule: motivate topics, descriptions, and plot development from the story level as much as possible. The functioning of this rule is particularly obvious when it is applied awkwardly. For example, at the beginning of a story, when the reader needs information about the story situation in order to enter the story world, a writer may provide this information while also following the immersion rule by beginning with a scene in which a stranger rides into town and asks an insider what is going on. If this is done skillfully, the reader will not notice the extra-fictional motivation for this scene, since it will seem plausible within the story world. If done awkwardly, it will cause even the most cooperative reader to "see through" the story-world motivation to the requirements of exposition, and thus the reader will POP out of her immersion within the story world. This principle can be, and in postmodern fiction often is, flagrantly and pointedly violated, with incongruous effects. For example, characters may argue with their "author" about a word choice.

3. The relationship between Gricean principles and narrative will be explored: This problem is related to the immersion principle. Although narrative must be motivated as far as possible from within the story world, it also must be understandable to the reader, who is usually, at the moment of beginning to read a narrative, completely unfamiliar with the story situation. In our research so far, we have found that Grice's Cooperative Principle (1975) does apply between a narrative and its reader (though the immersion principle requires that its functioning be backgrounded), but it follows a different dynamic from that of ordinary conversation. For example, in normal conversation, only referents which are already shared between a speaker and addressee are eligible for anaphora. But especially at the beginning of a narrative, one finds definite and pronominal references to objects which are unknown to the reader. These references are signs of the operation of the immersion principle: the motivation for their definiteness is to be found in the story world, not at the level of the text/reader. Nevertheless, the introduction of these referents to the reader is accomplished strategically, so that readers acquire knowledge about the story world in just the way which the text "feeds" it to them. Readers are required (indeed, they take pleasure in their ability) to "catch on" to a situation which is already familiar in different degrees to story-world participants. The reader is in this way analogous to someone trying to enter into an unfamiliar culture. Depending on the genre of fiction and the competence of the reader, this "catching on" process may be difficult or easy, but it must not be impossible for all readers or the purpose of fiction of providing readers with an experience will fail. Perhaps the Cooperative Principle as it applies to fiction is: if you as reader persevere in attempting to understand this text, it will give you an experience which will make your efforts worthwhile. This may require a lifetime commitment (*Finnegan's Wake*), or a moment's concentration ("The Far Side" cartoons). We believe that Gricean principles apply at the level of the text/reader, and we include in this category irony and other inferential aspects of the text. Irony tends to call attention to itself and therefore to POP the reader to the (author)/text/reader level, whereas most other Gricean moves are backgrounded.

4. The relations between language and worlds (both fictional and otherwise): One consequence of our theory of levels is that it highlights the changing epistemological relationship between language and world at different cognitive levels. A useful concept to use in this regard is Searle's (1983) notion of *directions of fit*, which can be either word-to-world or world-to-word. At the level of the story world, there is a word-to-world fit between referential words and their story-world objects; that is, fictionally speaking, story-world objects are epistemologically prior to the words which name them. At the text/reader level (the pragmatic situation of the reader encountering the text), a world must be constructed to fit the words of the text, and thus at this level words are epistemologically prior to their objects. Direction of fit between language and *experience* varies similarly in different contexts according to which "comes first,"according to Gendlin 1962. For example, in the relation Gendlin calls "explication," in which we try to put words to an already felt experience, experience functions to "select" appropriate words, while in the relation he calls "recognition," words *evoke* an experience. The study and description of directions of fit between language, world, and experience at different levels of fictional narrative is an important project for an adequate theory of narrative comprehension. A beginning to such a project is offered in Galbraith (1985, 1994).

5. We will explore the hermeneutic question: what is the nature of a reader's subjective relation to fiction? How does she "enter into" the selves and deictic fields which are structured by the text? At this point, we believe that there are several ways in which a reader's subjectivity can be "pulled in" by textual cues (Rapaport et al. 1989,

Wiebe & Rapaport 1988). Fillmore (1975) has also pointed out some of these ways and their relationship to deixis through a process he calls "contextualization." But there remains the question of how this is accomplished psychologically. In the history of hermeneutics, the problem of how one understands or enters into another's self has never been fully explicated. The intuitive conception of this process in interpersonal relations is that one somehow "feels from the other side" simultaneously with one's own side, as in Buber's (1958) notion of the I/Thou relation. An intuitively appealing description of a reader's relation to the "subjectivity" of a text is Gadamer's (1975) notion of opening oneself to the possible ways of being-in-the-world which the text offers and discovers within the reader. But the reader's relationship with the selves of characters in narrative text, or even with the author "through" the text, is not an I/You dialogic relation, as Banfield and Kuroda have convincingly shown. We will attempt to develop a theory of ways of "living a narrative" (and thus of entering different deictic fields) that are particular to narrative. This of course raises thorny issues, chief among them being: in what way can a computer participate in or even model this process of "living"? The individuals in our group have fundamental disagreements as to the answer to this question, but so far this disagreement has stimulated rather than interfered with our work.

Two methods of literary stylistics and the phenomenology of reading will be used in our project:

1. The intensive study of selected chapters of narrative, using competence at "immersed reading" to experience and reflect upon the effects of various narrative techniques, a method already well accepted in narrative theory. What makes our own use of this method empirically interesting is that (a) it is informed by the theory which we are developing, which takes advantage of terms and concepts from linguistics, cognitive science, artificial intelligence, psychology, communication, and philosophy as they apply to narrative understanding, (b) it applies these analytical concepts to the experience of aesthetic immersion, trying to find terms of the former with which to explicate the latter, and (c) it uses the aesthetic experience of an immersed reader as a means to "select" appropriate topics for further empirical research. The texts under study (Chap. 1 of *Great Expectations*, the Prologue and Chap. 1 of *What Maisie Knew*, Chaps. 1, 2 of *Jane Eyre*, Chap. 1 of *Portrait of the Artist as a Young Man*, and the first sentences or paragraphs of several other novels) were chosen because they each begin with a significant childhood event in the life of the novel's protagonist, and each attempts in its own way to convey the child's experience of this event, thus providing a good ground for the study of ways of capturing or conveying subjectivity.

2. Theory construction and articulation: As listed above. All these areas require further thinking, discussion, reading, collaboration, research, and writing. Our task is to translate narrative theory and phenomenology of reading into theses which can be tested using linguistic, psychological and computational methodology, and conversely, to convert our technical findings into a comprehensive, non-reductive theory of narrative which does not miss the most important aspect of reading fictional narrative—personal involvement. The notion of the deictic center is pivotal in such a theory.

6 Computational Recognition of Subjective Contexts (Janyce M. Wiebe)

As argued in previous sections, subjectivity is central to understanding of the DC. The goal of this part of our research is a computational theory of how readers recognize character's thoughts and perceptions (Banfield's *subjective sentences*) in third-person narrative, and of how references within subjective sentences are understood. Banfield (1982) categorizes the sentences of narration into subjective and objective sentences. *Subjective* sentences include those that portray a character's thoughts *(represented thought*) or present a scene as a character perceives it *(represented perception*). *Objective* sentences present the story directly, rather than through the thoughts or perceptions of a character. We call the thinking or perceiving character of a subjective sentence the *subjective character.* Our task is to recognize subjective sentences and their subjective characters.

As the model of the DC has developed, it has become evident that the WHO needs to be more complex than was originally anticipated. In the original formulation (Bruder et al. 1986), the WHO was a single construct representing the character whose actions the narrative is currently following, as well as the character whose thoughts and beliefs it is currently following. But these need not coincide: e.g., a narrative can follow the actions of a character as perceived by another. So, at least two constructs are needed; the subjective character is one of them.

Readers cannot take a sentence-by-sentence approach to the problem of recognizing subjective sentences, deciding independently for each sentence whether it is objective or subjective, and, if subjective, who the subjective character is. First, although thoughts and perceptions are often reported (as by sentences beginning with "He thought that . . . ," or "She saw . . . ,"), and thoughts are often accompanied by narrative parentheticals (such as "he thought" or "he realized"), many thoughts and perceptions are not marked in these ways. Second, subjective sentences do not always explicitly indicate who the subjective character is. For example:

(1) [1.1]He wanted to talk to Dennys. [1.2]How were they going to be able to get home from this strange desert land into which they had been cast and which was heaven knew where in all the countless solar systems in all the countless galaxies? [L'Engle, *Many Waters*, p. 91]

Sentence (1.2) is a represented thought, but it is not explicitly marked as a thought, and it does not explicitly indicate the subjective character.

However, subjective sentences that are not marked as such, or that do not indicate who the subjective character is, usually appear in the midst of other subjective sentences attributed to the same subjective character. That is, once a clearly marked subjective sentence appears for which the subjective character can be determined, unmarked subjective sentences attributed to the same subjective character often follow. Thus, to recognize subjective sentences in general, we need to consider subjectivity at the level of the discourse. For this reason, we extend the notions of subjective and objective sentences to the notions of subjective and objective *contexts*, which consist of one or more subjective sentences attributed to the same subjective character, or one or more objective sentences, respectively.

We have developed a discourse process that looks for the boundaries of subjective contexts using certain textual features (Wiebe & Rapaport 1988). These include reports involving psychological verbs (e.g., 'think', 'wonder', 'realize', 'want', 'remember') or perceptual verbs (e.g., 'see', 'hear'); predicate-adjective sentences with psychological adjectives (e.g., 'delighted', 'happy', 'jealous', 'scared') (cf. Doležel 1973, Cohn 1978, Banfield 1982); what we call *psychological actions* (e.g., "he smiled to himself", "she gasped", "she winced"); and what Banfield calls *subjective elements*, which are linguistic elements that must be understood with respect to the subjective character's consciousness (e.g., *exclamations*, which express emotion; certain *kinship* terms, e.g., 'Aunt Margaret', which express a relationship to the referent; and *evaluative adjectives*, e.g., 'poor', which express an attitude toward the referent).

Information conveyed in subjective contexts reflects the beliefs of the subjective character (Uspensky 1973, Fillmore 1974, Banfield 1982). We have also developed an algorithm for understanding non-anaphoric, specific references ("the reference algorithm"), which takes this fact into account (Wiebe & Rapaport 1988). Our discourse process informs the reference algorithm whether or not there is currently a subjective character. If there is, the reference algorithm understands references with respect to the subjective character's beliefs (the belief representation used is that of Rapaport 1986 and Wiebe & Rapaport 1986). The algorithm can understand (1) references reflecting a character's mistaken beliefs or a character's limited knowledge; (2) indefinite references that refer to referents who *have* been introduced previously, but with whom the subjective character is *not* familiar; and (3) definite references that refer to referents who have *not* been introduced previously, but with whom the subjective character *is* familiar. By using Peters & Shapiro's (1987ab) representation of natural category systems, it can understand from an indefinite reference with

a superordinate term that the subjective character can identify the referent only at a superordinate level (cf. Rosch & Lloyd 1978).

We propose to enhance the computational model described in Wiebe & Rapaport 1988 in the following ways:

(i) We will tie the NOW of the DC to the subjective character according to two principles: First, the NOW in subjective contexts is the "moment of the act of consciousness, the moment in which" the subjective character is thinking or perceiving (Banfield 1982: 99). Second, information in subjective contexts reflects the subjective character's beliefs at the moment of consciousness (i.e., NOW) in the story, not beliefs held at some other time, e.g. the "time of narration." Our discourse process will use these principles to understand that if a character is currently topicalized by the text, and yet there is evidence that the NOW is distanced from that character (e.g., by a distal deictic, such as "that morning", referring to the time of the currently narrated events), then subjective contexts attributed to that character cannot directly occur. In accordance with the second principle, we will enhance our belief representation with Almeida's (1987) representation of the temporal relations of narrative text.

(ii) Character's thoughts often exhibit argument structure. For example, the relationship between two subjective sentences might be a position-support relationship. Our discourse process will use words and phrases indicative of argument structure to recognize subjective contexts. Examples are: 'instead'; 'although'; 'but'; 'yet'; 'at least'; 'if only'; 'anyway'; 'after all'; 'even if'; conditionals; and modals of obligation, possibility, and necessity (including the semi-auxiliaries 'have to' and 'had better'). Our preliminary work suggests that both objective and subjective contexts can exhibit argument structure. We will investigate under what circumstances argument structure is indicative of subjective contexts.

(iii) Non-anaphoric references are not the only kind of references that can reflect a character's mistaken beliefs or a character's limited knowledge; anaphoric references can as well. We will specify how algorithms to understand anaphora need to be modified to understand references in subjective contexts.

(iv) To date, the information flow between our discourse process and the reference algorithm is only one way: the discourse process informs the reference algorithm whether or not there is a subjective character, but the reference algorithm gives the discourse process no information in return. However, a reference can indicate that the sentence containing it is subjective, and it might provide the only means for recognizing the subjective context. For example, a reference might reflect information that the reader knows only a certain character believes. Or a referent might be referred to in a certain way by one particular character (cf. Uspensky 1973). An example of the latter type of reference is found in *Lonesome Dove* by Larry McMurtry. Newt is always thought of as 'the boy' by Call, and only Call thinks about him in this way. Thus, an appearance of 'the boy', referring to Newt, can mark a subjective context attributed to Call. We will enhance our knowledge representations and the reference algorithm to enable the reference algorithm to recognize subjective contexts based on references, and to inform the discourse process when it has done so.

7 Children's Acquisition of Deictic Perspectives in Narrative (Judith F. Duchan, Lynne Hewitt)

This part of our project is aimed at understanding the acquisition of deictic perspectives in children's early narratives, with a special focus on how and when children learn to anchor deictic centers in the point of view of the central characters in their narratives. The goal will be to trace the developmental progression of children's use of (1) objective and subjective contexts; (2) dramatic versus narrated modes of content presentation; and (3) the devices which help the listener distinguish objective from subjective contexts.

We hypothesize from our pilot work and from published literature that children's earliest narratives will not represent the subjectivity of third person characters. The earliest subjectivity to appear will be in first-person narratives, which are by definition produced from a subjective stance, where the child narrates a first-person fictional account in her own persona (Sutton-Smith 1981). We anticipate that these beginning storytellers will present third-person characters either objectively or from their own point of view as a first-person narrator. In addition, there are some very early examples which are ambiguous, in that they contain deictic elements in spite of the fact that the story has as yet no location or characters established: "A train came on a train track. And the other cookie monster came. That's all." (Sutton-Smith 1981: 55–56; produced by a 2-year-old).

From this "egocentric" stage, we expect children to evolve into a stage we call "dramatic," in which they are able to use first-person indicators in directly quoted speech. We found a few 3-year-olds and many 4-year-olds who told stories containing first-person quotes from fictitious characters. For example, the following are excerpts from

stories by two 3-year-olds: (1) "Then he say: 'I superman' " (Sutton-Smith 1981: 60); (2) " 'Where's my plants?' said the bird" (Sutton-Smith 1981: 81). Both storytellers are relaying the speech of a character as if they were speaking lines in a play.

The third stage, which we term the "narrative proper" differs from the second in that the first-person perspective is not simply that of a report of a character's utterance, but the representation of another self in a narrated frame. In addition, we have found (Hewitt & Duchan 1989) that around 4 or 5 years our pilot children introduced third-person subjectivity into their narratives. Thus, the deictic terms in this narrative style may be centered in the subjective perspective of a story character (that is, the subjective character or focalizing WHO), or in that of a fictitious first-person narrator (and possibly both).

In our pilot work on the stories of one 5-year-old subject, we found her capable of using the following indicators of subjectivity:

1. use of first-person pronouns to represent fictitious characters and narrators;
2. ability to shift from first to third person when referring to a fictitious first-person character in communicative discourse outside the narrative line (e.g., when looking up to comment on a picture of a character referred to in the story line as "my dad," she referred to the same character as "the dad").
3. shifting from past to present tense to represent characters' thoughts directly (unmarked by statements such as "she thought");
4. signalling a character's belief system by use of the lexical connective "but";
5. making a clear distinction between beliefs of characters and the "true" state of affairs in the story world.

We predict that older children will continue to develop competence in manipulating and defining subjective and objective contexts in their narratives. In particular, we will examine the narratives of 5- to 7-year-old subjects for the occurrence of indicators of subjectivity identified by Wiebe & Rapaport (1988) and Wiebe (1990) in their computational model of subjective contexts (cf. §6), and Galbraith's analysis (1985, 1990, 1994)) of indicators of subjectivity identified by narrative and literary theory (§5).

The project being proposed is a three year longitudinal study of four subjects, two 2-year-olds and two 5-year-olds. At the beginning of the study, the 2-year-olds will be at the threshold stage for narrative discourse; at the end, they will be beginning to achieve competence in expressing deictic constructs from the perspective of the characters in their stories. The 5-year-olds should have already developed their ability to narrate from a single character's point of view. We will examine the development of subjectivity in their narratives, up till the age when they will be reading simple texts.

In addition to the longitudinal study, we plan to conduct a cross-sectional study during year 3. We will select 10 children at each of the six age groups studied (2–7 years). We will select for detailed analysis and elicitation the deictic indicators of subjectivity identified in the longitudinal study. Among the candidates for study are: verbs of perception and consciousness; personal pronouns; deictic predicates; subjective elements (as defined by Banfield 1982); and other factors identified by Wiebe (1990) to be strong indicators of subjectivity.

7.1 Pilot Data

The three-stage developmental hypothesis to be tested in this proposal was derived from the study of narratives generated by a group of 30 preschool children, ages 2 to 5. The data came from two sources. One was Sutton-Smith 1981, which provides the transcriptions of stories volunteered by children to a "story taker" who visited their preschool classroom. The storytakers were introduced to the children as "people who like to collect stories from children, and someone to whom you may tell a story at any time you wish" (Sutton-Smith 1981). The total number of Sutton-Smith's stories used in the pilot study were 216, told by 29 different preschoolers, averaging 7 stories per child.

A second data source for the pilot work was from videotaped stories told by a 5-year-old, Ellie, to a graduate student from our research group. The child was known among her family and friends as a "good storyteller", and she was videotaped telling "made up" stories, retelling stories from familiar picture books with and without picture support, and retelling familiar orally presented stories (e.g., The Three Bears). The stories were collected in her home over a period of $6\frac{1}{2}$ months. There were 44 stories in all.

The corpus of 260 stories were analyzed in two ways. The Sutton-Smith stories were analyzed to see how children introduced characters into their stories and how their means of introduction changed with age; the Ellie stories were analyzed for their subjective indicators.

The character introductions for 3- to 5-year-old children differed depending upon where in the stories the characters were introduced. When characters were introduced at the beginning of stories (in the first one or two sentences), their mention was most often in conjunction with deictic indicators of general time and place: "Once there was a tiger. He was in the zoo" (Garrett, age 4; Sutton-Smith 1981: 104). Characters who were introduced later in the story were brought into the story in one of two ways: with a deictic 'come' without specification of place or time or with a verb expressing some sort of subjective contact between an established character and the introduced character. An example of 'come' used to introduce subsequent character was from 4-year-old Garrett (Sutton-Smith 1981: 106), who seems to be experimenting with the form in the following story:

One day was a bullfight.
Airplane came.
Monster.
And then a blast-off came.
And then airplane came again.
And then a racing car came and crashed the airplane.
And then a baby came.
Monster came.
Everyone came.
And then everyone stopped the fire.
All the peoples came to see the fire.
Now its finished.

The verbs of social contact used to introduce a character included the following: find, see, ask, meet, have, get, live with.

The percentages of use of three prevalent devices out of the total first-mentions of characters by children in the Sutton- Smith corpus were as follows:

	there	come	contact verb
2-year-olds	1	0	0
3-year-olds	14	11	1
4-year-olds	28	13	3
5-year-olds	12	21	19

The shift in the use of the subjective contact verbs at five years offers beginning evidence for the emergence of a new stage in children's notions about character subjectivity at five years.

In summary, we take the presence of temporal-spatial deixis in the beginning of the story in conjunction with character introductions to be evidence that beginning story-tellers are aware of the convention of, and perhaps the need for, establishing a DC at the outset. Their later introduction of characters through use of 'come' unaccompanied by place and time indicators we take as evidence that they are bringing the new characters into an already established DC, and one that can be presupposed. The contact verbs were subjective markers, introducing a new character through the perspective of an established character.

A more detailed analysis of subjective markers in children's stories was conducted using the Ellie videotapes and transcripts as a data source. Her stories contained multiple examples of following subjective indicators:

(1) First-person pronouns used to represent fictitious characters and narrators: The following are the first lines in her telling of stories while looking at the pictured characters in a storybook. In the first example, the pictured character is a chipmunk; in the second, a boy (numbers below indicate the story and line in the story):

2.2 Daddy was reading the newspaper one morning, when I went out.
3.1 Me and my mom went out to get blueberries.

(2) Shifts from first- to third-person to refer to a story character ouside the narrative line (shift in 3.10):

3.7 I took some out of my mom's basket,
3.8 so I could have more than I wanted,
3.9 because I couldn't pick 'em.
3.10 See, HE'S picking some of HIS MOM'S basket. (to listener, pointing to picture in book)

(3) Shifts from past to present tense to represent characters' thoughts directly, as in 2.14 below:

2.11 Then I went
2.12 I went to sleep
2.13 but I was a little scared
2.14 what's GONNA HAPPEN tonight?

(4) the connective 'but' used to show how a character might be thinking:

43.10 He pushed and pushed,
43.11 BUT he couldn't
43.12 It was because he was too short
43.13 and he, and he
43.14 the keys weren't in
43.15 That must be hard.
43.16 BUT then the person came back.
43.17 He hurried back in the trunk.
43.18 BUT noboby saw him.
43.19 He scurried back.
43.20 BUT he'd liked to be like a person.
43.21 BUT he didn't like to do that.
43.22 so he went back in the trunk.
43.23 and he went through the floor
43.24 BUT then, he really didn't think that would really
43.24 that the policeman would still see him.

(5) Distinctions made between a character's belief and what is "true" for story line outside the character's belief system, as can be seen by her use of 'but y'know what' and 'really' in lines 11 and 12 of the following story excerpt:

4. y'know what,
5. she had a bottle of medicine,
6. it's peter's,
7. then y'know what she does,
8. she drinks it
9. and they pretend it's poison=
10. and goes like this.
(FLOPS DOWN ONTO FLOOR)
11. but, but y'know what?,
12. it's really red koolaid,
13. and red koolaid can't hurt you a bit.

The pilot data served to guide the methodology and design of our project in the following ways:

(a) It gave us a representation of children's stories at different ages, providing us with evidence for the early development of subjectivity in children's stories.

(b) It indicated the need for using videotaped data rather than written transcripts already available, since the subjective shifts were often marked by vocal register (e.g., a change in voice for expressing the thoughts and speech of story characters), and by change in posture and visual contact (e.g., Ellie's shift in gaze and posture when moving from the narrative frame to one where she comments on the story).

(c) It gave us a sense of how best to elicit stories naturally from children, and a variety of ways for that to be done (with and without available books, using familiar and made-up stories, with and without object props). The current proposal will use a variety of these methods to further study these presentation differences.

8 Psychological Measures of Deictic Indicators and the 'WHERE'

(Gail A. Bruder)

Our research to date has established the utility of three behavior measures and tasks for assessing certain linguistic devices hypothesized to influence the establishment or updating of the DC and for investigating our hypotheses about the role of a DC in narrative comprehension. *Sentence reading time* gives us a measure of the difficulty of extracting information from the text, making inferences, and integrating textual and other information. *Latency* in answering questions about the text provides information about the accessibility of the information, in particular what is currently "active" in memory. *Answer choices* provide information on the content extracted or inferred from the text.

Two linguistic devices related to the WHERE of the DC have been evaluated: preposed locative adverbials and deictic verbs. Our research suggests that devices differ in whether they influence the content of the information or the ease with which such information is extracted or inferred. The results of our reading-time studies (Bruder, Engl, & Schultz 1985) suggest that preposing locative adverbials facilitates the comprehension of sentences which indicate a shift in the WHERE, but does not seem to be a unique determinant of whether the shift will occur. Studies asking readers to locate characters in relation to the WHERE did not show significant differences in accuracy or certainty as a function of the location of the adverbial (Bruder 1988). There were differences attributable to the presence or absence of such adverbials. The presence of an adverbial referring to a new story location was interpreted by readers as a shift in the WHERE, regardless of its sentence position.

On the other hand, the deictic verbs ('came'/'went') clearly influenced readers' judgments about the location and identity of characters relative to the DC (Bruder 1988). The verbs do not seem to differentially influence how quickly this information is extracted and integrated. Variations in the verb of motion had little effect on reading time.

The second measure, answering time for questions presented immediately after the text, indicates that information about characters in the current DC is more quickly accessed than information about characters no longer in the DC (Daniels 1986). As in previous studies, the linguistic devices used to shift the DC included the deictic verbs.

Careful examination of the natural narrative used in some of the studies (Steinbeck's *The Pearl*) also provides evidence of the influence of additional influences. Prior story context, cultural knowledge, and reader characteristics (gender) influence the interpretation of sentences when ambiguity exists in either the WHERE of the DC or the locations indicated in the sentences (Bruder 1988). One of the advantages of using natural narrative is the discovery of such factors, which can then be systematically investigated in constructed text or in additional natural narratives.

Building on these findings, we propose to continue using all three measures on both natural and constructed narrative. We also plan to have readers generate continuation sentences to short narratives and to retell short narratives, in order to (1) provide additional information on the reader's mental model of the story and the currently active DC, and (2) eliminate the potential influence of the test questions on the reader's current mental model, including the DC. We will use all these techniques to continue to test hypotheses about the role of the DC in narrative comprehension as well as the linguistic and other devices which influence the construction and updating of such a DC. In addition, we will use priming tests to assess the permanence of DC representations in memory. We will investigate whether objects or events which are related through their presence in a common DC (e.g., two objects in the same WHERE) will prime each other even when they are not mentioned in close proximity in the text.

8.1 Description of a Priming Study of Story Objects and the WHERE

This experiment will study the effects of the deictic WHERE on longterm memory of narrative text. Subjects will read short stories, adapted from natural narratives such as Beatrix Potter's *The Two Bad Mice*, in which events occur in one, two, or three locations. After reading each story, subjects will be presented with questions asking the subject to recall whether a particular object appeared in the story. There will be three critical pairings of prime and target objects according to three scenarios: (1) both objects introduced into the same WHERE, with no intervening change of scene, (2) both objects introduced into the same WHERE, but separated by an intervening excursion to a different

WHERE, and (3) objects introduced into different WHEREs. The amount of physical text, story time, and number of propositions between the introductions of the two objects will be controlled. In addition, the story objects will not be directly related through argument repetition. Faster response times are expected for objects introduced within the same story location than for objects introduced in different locations.

8.2 Description of Experiment Testing Effects of Deictic Indicators

We will test the reliability of our previous findings by doing new studies using narratives of a different genre from our original text, *The Pearl*. In particular, we will test these hypotheses: (1) that preposing adverbials influences processing time; (2) that deictic verbs disambiguate the locations of events, shift the DC and influence which character's point of view is taken on an event; and (3) that deictic verbs influence the contents of the mental model. One experiment is now under way, which uses short, self-contained passages from Garrison Keillor's *Lake Wobegon Days* and *Leaving Home*, is described in this section. Short, self-contained narratives from Garrison Keillor's *Lake Wobegon Days* and *Leaving Home* will be used as passages for study. Twenty four passages containing deictic verbs (came/went and take/bring) and preposed locative adverbials will be used. The passages will be manipulated to test the effects of the deictic verb. For one third of the subjects, the passage will be altered from one deictic verb to its opposite (e.g., "came" changed to "went"); for another third, the deictic verb will be changed to a nondeictic verb (e.g., "walked"); the remaining third will read the passage as originally written. Similarly, for the passages with adverbials, readers will receive no adverbial, a preposed adverbial, or an adverbial in non-initial position. The passages will be presented by computer one sentence at a time with the reader in control of the presentation rate. Each passage will be followed by a series of three statements, also presented one at a time. The reader will indicate on a scale of 1 to 6 her/his degree of agreement with the statement.

Sample passages and test statements [Note: The words used in the different versions are indicated in brackets]:

PASSAGE ONE.

> The upshot was that Clarence and his wife, Sarah, had to get up at six A.M. and go to the Minneapolis-St. Paul airport. They had to find a certain freight terminal, sign a receipt for Uncle Virgil's body. The young man at the terminal didn't want to let them put the box into the panel truck instead of hiring a hearse. The man told them that he was only an assistant manager and didn't make the rules. He said, "would you want people hauling you in an old truck after you pass on." Clarence said, "It depends who the people are." When they finally got back home with Uncle Virgil, they took the box to Lundberg's Funeral Home. Clarence stayed there with the funeral director while Sarah [came/went/drove] to the church to talk to Pastor Ingquvist. They discussed the arrangements for about a half hour.

TEST STATEMENTS:[1]

1. Clarence discussed funeral arrangements for about half an hour.
2. Sarah discussed arrangements with Pastor Ingqvist for about half an hour.
3. Uncle Virgil's body arrived by train.

PASSAGE TWO.

> Barbara and her children drove to her friend Ruthie's house to visit. Ruthie has three of her own and all three were playing in their yard. Her three and Barbara's three sniffed each other for a moment and then two cats made the mistake of coming around the corner of the house. The cats realized it was a mistake and backed away, saying Uh, sorry didn't know you were here. We'll come back later. But the kids grabbed the cats, and [took/brought/dragged] them indoors. Ruthie knew what the cats were in for—being dressed up and placed in the doll buggy, two little cat children.

[1] Sentences marked here with an asterisk are those used to test hypotheses. Other test statements are fillers used so that readers won't tailor their reading to processing just location/character information.

TEST STATEMENTS:

1. Three cats came around the corner into the yard.
2. Ruthie was inside when the children dragged the cats in.
3. The cats were glad to see the children.

PASSAGE THREE.

To Dede, washing pots and pans in the back of the Chatterbox, the snow came as quite a thrill. It had been so long since she had seen snow, she had almost forgotten about it. Tiny white crystalline flakes falling through the air. Billions of them, no two are the same. She scraped at the the crusted noodles on the bottom of a big aluminum bake pan and looked out the little window fogged with grease. [Outside the backdoor of the cafe, the parked cars were disappearing under a white blanket/The parked cars were disappearing under a white blanket outside the backdoor of the cafe/The parked cars were disappearing under a white blanket.] Bud had been out with his plow but there wasn't much he could do yet. The state plows weren't quite finished. So he sat and drank coffee.

TEST STATEMENTS.

1. Bud was sitting in his truck drinking coffee.
2. Dede was looking out the window at the parked cars.
3. Bud was drinking coffee in the cafe.

8.3 Additional Devices

Additional devices hypothesized to influence the DC and narrative comprehension will be studied using all techniques—reading time, question-answering, generation of continuation sentences, and story retelling. The linguistic devices will include: (1) additional devices related to the WHERE (deictic adverbials, e.g., "behind the door"; other deictic verbs); (2) devices which influence the WHEN (tense, aspect); and (3) devices which influence the WHO (markers of subjectivity such as expressive elements, and evaluative adjectives (see §6)). We are particularly anxious to explore devices related to both the character in active focus and the point of view taken (see §6 and Appendix A). In the comprehension components of the tasks undertaken, both the content and time will be examined to determine whether the devices primarily influence processing (information extraction and/or inferencing) or the content of the narrative representation.

The same techniques will then be used to investigate the effects of: (1) agreement and conflict among deictic devices shown to influence one of the components of the DC; (2) interaction of the WHERE, WHEN, and WHO components; and (3) extralinguistic factors such as prior story context, world knowledge, and gender differences. Finally, we will systematically manipulate the validated linguistic and extralinguistic factors in order to study the interaction of these factors in narrative comprehension. For example, if gender is found to be important, the gender of readers and story characters will be manipulated at the same time as validated linguistic devices in order to determine the relative contribution of such factors to the point of view taken by the reader.

Natural narrative will be examined in initial explorations. Manipulations of natural narrative, as well as constructed text, will be used to test specific hypotheses. We will use several different narratives, of varying types, to test our hypotheses and verify our findings.

9 Cognitive Maps and the WHERE (David M. Mark)

Answers to the question "Where?" take a major part of their meaning from the relation of foreground elements to a frame of reference. Absolute locations (such as latitude-longitude coordinates) are rarely meaningful in isolation; it is the locations relative to other features which are important. As an extreme example from a non-linguistic domain, a map showing locations of boat-launching areas is essentially meaningless without a plot of "base map" information, such as a shoreline, populated places with labels, selected roads and rivers, etc., on the same coordinate system. In order for CASSIE to represent the meaning of spatial references in narrative text, she will need to represent spatial knowledge extracted from earlier parts of the story in a formal and consistent manner, in order to provide a framework for further spatial references.

The relative importance of geographic references in narrative will depend greatly on the genre of narrative. There are many examples of quests or sagas in fantasy; a classic example is Tolkien 1966. In such narratives, spatial references are important for establishing the objective of the story and tracking progress toward the story's goal(s). In other narratives, spatial references may be highly fragmented and incidental to the story itself. Stories set in real places form a special case, since the reader's world knowledge can be used to enrich the story world, yet the author usually cannot rely on the reader's familiarity with the setting; furthermore, the author must be consistent with the real-world setting or risk losing the confidence of the informed reader. What world geographic knowledge should Cassie be given (she is given the lexicon; why not an atlas as well?), and how should that knowledge be used in understanding stories?

In a series of reports, Kirby and his colleagues have shown that access to maps improves comprehension and fact recall for non-fictional narratives (Kirby, Jurisich, & Moore 1984; Kirby 1985; Moore, Scevak, & Kirby 1987); what are the implications of these results for the understanding of fiction? Our own analysis of spatial references in Steinbeck's *The Pearl* reveal a number of references to geographic space that, when combined with real-world knowledge, make it possible to infer many properties of the story location, and to determine that the story was set in La Paz, Baja California, Mexico. However, it is clear that the relation between the geographies of the story-world and the real world has little if any bearing on the comprehension, appreciation, or enjoyment of the narrative itself. Evidence for this is found in the fact that, even though most members of our research group were highly familiar with *The Pearl*, most of us believed that the setting was fictional, although some thought it to be "somewhere in western Mexico."

9.1 Cognitive Maps of Story Worlds

As a working hypothesis, we propose that a reader's mental representation of the spatial relations among geographical locations in a story is similar to a cognitive map, the mental representation of a real, large-scale geographic space with which an individual has had experience. In particular, Kuipers' TOUR model for knowledge acquisition during way-finding (1978, 1983ab), will provide a starting point for Cassie's model of spatial knowledge acquisition during the reading of a narrative:

> To represent [spatial] knowledge and its uses in the cognitive map, the TOUR model has three classes of representations: (1) representations of knowledge about a particular environment; (2) a description of the current position (the "You-Are-Here" pointer); and (3) representations for inference rules which manipulate knowledge of the other two kinds. (Kuipers 1978: 133)

Note that (2) is the WHERE of the DC. The TOUR model takes as input route descriptions which usually involve the movement of the "You-are-here" pointer; TOUR then assimilates information from routes into a topological model of paths and connections in the cognitive map, infers geometric information, and uses the augmented model to solve problems. Kuipers (1978) concluded by making a number of predictions about spatial knowledge acquisition and recall. Kuipers (1978: 152) listed the problem of "understand[ing] stories by reference to regional similarities or differences" among problems that TOUR should be useful in solving. Kuipers' implementation of TOUR was given route information in the form of ordered sets of "view-action" pairs, where the "view" is the sum total of sensory experiences at a point, and the "action" is the response to be taken in order to follow the route ("turn left," "continue straight," etc.). TOUR was able to build topological and eventually geometrical information by reasoning about the routes.

Based on Kuipers' discussion of TOUR and on our knowledge of cognitive maps and of narrative understanding, we predict that the topological and especially geometric information in the mental map of a story world will be under-specified. Thus, we predict that, in cognitive maps derived from narrative text, the overall geometry (angles, orientation) will be highly variable across readers; that distances along paths between important story locales will be somewhat consistent; and that the topology (such as the sequences of locales along paths) will be highly consistent. However, if angular geometry or distance is important to the story, we predict that the narrative will contain sufficient cues and clues to allow the reader to determine these properties. If Cassie is to represent the mind of an individual reader, she will have to retain a probabilistic (statistical or, perhaps, fuzzy) representation of places and spatial relations, so that the possible geometries will all be consistent with the model; there must also be a way to assimilate new facts and to revise (fine-tune) the geometry of the cognitive map to reduce the uncertainty. Finally, Cassie must be capable of recognizing inconsistent spatial scenarios in which all "facts" cannot simultaneously be accommodated within the model (see discussion of Riesbeck 1980, below). Research will be needed to determine whether this elaboration of detail in Cassie's cognitive map can be treated as a belief-revision problem (using SNeBR; cf. §2, above).

The "cognitive map" hypothesis for understanding the spatial aspects of narrative will be tested in two ways: experiments involving human readers, and development of formal models for building cognitive maps from narratives. In the experimental work, subjects will be asked to read a piece of narrative text and then to draw a map and/or describe the "geography" of the story-world, the space in which the story is set. One group of subjects will be allowed to consult the text while constructing the description of the geometry; another group will perform the task based only on their recall of the story. The representations will be compared for consistency across subject and with a consensus map constructed by the investigators; they also will be tested against the specific predictions listed above. In the computer-modeling effort, a variant of Kuipers' TOUR model will be implemented in SNePS/Cassie and then tested on narrative passages dominated by descriptions of, or references to, geographic space. In order to integrate this module into Cassie, the program would first have to identify and isolate view-action pairs from the narrative and then pass these in turn to a TOUR sub-module.

9.2 Scale and the Reference Frame

One important property of reference frames is that they have characteristic scales (Mark, Svorou, & Zubin 1987; Nakhimovsky & Rapaport 1988); this property has received almost no attention from other researchers in the cognitive, linguistic, or geographic sciences. The statements "my barbecue is near my swimming pool," "my house is near the University," and "Santa Barbara is near Los Angeles" all appear sensible, convey some meaning (including some range of probable distances), and may even be correct, even though the distances involved may be 10 meters, 5 kilometers, and 150 kilometers, respectively. The sizes of the objects involved, together with prototypes for spatial interaction between objects of the particular kinds, may provide the meanings of "near" in each case. For example, the reader may interpret "my house is near the University" within the context of journey-to-work; the meaning may be that, compared with the prototypical distances that people travel to work in the place and culture under discussion, the actual distance between "my house" and "the University" is relatively small.

In addition to work by our group (cf. Rapaport et al. 1989, Yuhan 1991), there has already been some research on the geometric meanings of spatial terms such as "here," "near," and "in front of" in English. Robinson, Thongs, & Blaze (1985) used the PRUF (Possibilistic Relational Uniform Fuzzy) framework from fuzzy-set theory (Zadeh 1981) to provide representations of spatial and spatial-relational concepts embodied in words in the English language in a way that "preserves their approximate nature" (Robinson, Thongs, & Blaze 1985: 161). As an example, they attempt to define the concept embedded in the English word 'near'. Robinson, Thongs, & Blaze (1985: 162) presented an expression in PRUF that "represents a procedure that returns the fuzzy subset of [the set of all cities] comprising cities that are near [a specific city]". Basically, the method makes "educated guesses" of cities that may be at the boundary between NEAR and NOT_NEAR, until that boundary has been defined to a desired degree of certainty. They illustrate the process with a simulation that determines which points in a 9-by-9 grid are "near" the point in the center of the grid.

Robinson, Blaze, & Thongs 1986 and Robinson & Wong 1987 continued this line of research. Five experimental subjects used an interactive program based on the PRUF method to identify towns that were "near" a target town. One test-data set consisted of 29 settlements in Georgia, the other of 112 places in Connecticut. The subjects could consult a 1:250,000 scale map during the sessions. Robinson and Wong also compared the sets resulting

from several closely-related yet distinct terms: 'near', 'far', 'in the vicinity of', 'remote from', 'close to', 'distant from', 'short distance from', and 'long distance from'. These terms led to similar yet different sets. The authors did not show how any of these sets could be predicted for a new set of places. Nor did they show how the overall scale of the situation influences the results. The scale problem is central to our proposed research on this topic.

Once again, our research will involve human subjects. The focus will be to attempt to ascertain the geometric ranges that correspond to terms such as "near" or "in front of" in a wider variety of situations than studied by Robinson and his co-workers. Some subjects will be presented with a situation and a phrase, and asked whether the phrase is a reasonable way to describe that situation. Other subjects will be asked to divide sets of objects (cities, buildings, etc.) into subsets corresponding to those that are "near" some member of the set, and those that are "not near." The sets will be presented graphically to some subjects (e.g., as a regional or campus map), and verbally to others (e.g., as a list of city names or building names). Observed regularities will be related to the concepts of prototypes outlined above and to real-world experience with the places in question; follow-up surveys will attempt to relate exceptions to differences in assumed prototypes.

9.3 Directions for Way-Finding

One of the few studies concerned with the extraction of spatial knowledge from text sources is Riesbeck 1980, which provides a formal model for determining whether a set of driving directions is "clear" or "ambiguous," based only on internal consistency properties (i.e., with no "real world" knowledge). The fact that Riesbeck's model does not require access to the "true" geography in order to judge whether directions are clear suggests that some of its principles will be applicable to spatial accounts in fictional narrative. We recognize that driving directions are a much more restricted domain than is narrative in general. Nevertheless, this restricted nature permits us to test the understanding of spatial relations in text in relative isolation. This topic will also be explored experimentally and through formal modeling.

In this part of the research, we will investigate the production of spatial language, rather than its comprehension. In an experiment involving human subjects, we will collect driving directions by approaching adult subjects in public places (probably in shopping malls), asking them for directions to other public places, and tape-recording the results. These taped directions will be transcribed and analyzed, with particular attention to the use of spatial prepositions ('in,' 'out,' 'up,' 'down,' etc.), of cardinal directions ('north,' 'south,' 'east,' 'west'), and of deictic references ('here,' 'there,' 'come,' 'go').

In a pilot study, several subjects were approached individually in Boulevard Mall, a large suburban shopping mall in the Buffalo area, and asked, "Could you please tell me how to get to Eastern Hills Mall?". The latter is another suburban mall, located about 6 miles east and one mile south of the interview site. The following is one of the shorter and clearer sets of directions (the interviewers comments appear in braces):

> Eastern Hills Mall? The best way to do it is to go straight down, uh, Maple here, Maple to Transit OK. You'll turn right on Transit. yes It's about . . . you'll go about a mile and a half you'll pass under a . . . like a viaduct OK just past that on your left is Eastern Hills Mall. OK. Thanks a lot You're welcome.

The use of the future tense, the second person, and the deictic references in this and other verbal directions suggests that the direction-giver is "replaying" the trip in his or her mind, visualizing landmarks along the way, and describing the trip that the direction-seeker will make if he or she follows the directions. Several view-action pairs can be extracted from this route description and could be given to the TOUR model to begin building a model of the local geography.

In a second study, some of the spatial key words produced by the subjects in our first study will be eliminated and replaced with blanks; other subjects will then be asked to fill in the blanks, and their choices will be related to the words used by the original subjects and to the "real world" street pattern and other relevant geographic features. During these experiments, some subjects will be given maps showing the "actual" geometries of the routes, while others will be familiar with the area and have to rely on their local real-world knowledge in order to fill in the blanks. The results will be used to provide models for the use of such words in driving directions and (hypothetically) in narrative text in general.

A related computational task will attempt to model formally the comprehension of driving instructions. Riesbeck's model for judging the clarity of directions will be implemented within SNePS/Cassie. Then, after modification based on the human-subjects experiment, its implementation will be used to recognize and extract geographical-spatial references contained within more general narratives.

10 A Final Note

The narrative comprehension project is and will continue be conducted by a substantial group of cognitive scientists and other scholars who are already working closely together. The group meets weekly to develop research plans, share results, and pose new questions about narrative understanding. In addition to researchers from computer science, linguistics, and psychology, the group includes representatives from fields not ordinarily considered part of cognitive science—literary theory, geography, and communicative disorders and sciences. This diversity of fields enriches the group's perspective on narrative understanding and raises challenges to disciplinary isolationism, stimulating us to think creatively and productively about cognitive-science approaches to narrative.

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