14 The Linguistic Structure of Discourse

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0 Introduction

We take as the goal of our formal work in discourse analysis explaining how speakers almost without error interpret personal, temporal, and spatial deixis, recover the objects of anaphoric mention, and produce responses which demonstrate that they know what is going on in the talk despite disturbances to orderly discourse development (Polanyi 1978, 1987, 1996; Polanyi and van den Berg 1996; Polanyi and Scha 1984; Scha and Polanyi 1988). With the informal description of the Linguistic Discourse Model (LDM) in this chapter, we take a first step toward this goal by proposing answers to three basic questions: what are the atomic units of discourse? What kinds of structures can be built from the elementary units? How are the resulting structures interpreted semantically? After sketching machinery to account for discourse segmentation, parsing, and interpretation, we will conclude by addressing the concerns readers of the present volume may have about the utility of a formal theory of discourse. What sort of work could such a theory do? To argue for our approach, we will examine the data and discussion presented in Prince's (1988) account of Yiddish expletive, ES + Subject Postposing. We will use the Yiddish data to show how the LDM analysis allows us to give a much more principled account than has been possible before of what it means for an entity to be "new in the discourse." In the concluding section of the chapter, we will broaden the discussion to argue for the benefits to sociolinguists and other discourse researchers of the formal methods we have proposed.

1 Discourse Segmentation

In the LDM framework, two types of basic discourse units are recognized: the propositional content carrying the elementary discourse constituent unit (E-DCU) and the extrapropositional discourse operator. These two units reflect the traditional linguistic distinction between **content** and **function**. We claim that discourse can be segmented

exhaustively into these basic units which are then combined into more complex units by the rules of complex discourse unit formation discussed in section 2 below.

1.1 The e-discourse constituent unit (E-DCU)

We define the **e-discourse constituent unit** (E-DCU) as a contextually indexed representation of information conveyed by a semiotic gesture, asserting a single state of affairs or partial state of affairs in a **discourse context** (DC). We can informally think of a DC as some sort of conceptual world modeled by the discourse construction process. Each DCU, whether linguistically or paralinguistically encoded,[1] expresses an event or in general a state of affairs in some spatiotemporal location, involving some set of (defined or as of yet undefined) participants (Davidson 1967). The event will be either positive or negative, generic or specific.

Under the LDM, higher-level discourse structures such as genre-defined constituents and **speech events** (Hymes 1972) play an important role in discourse interpretation. Genre units such as stories, negotiations, or arguments have a characteristic constituent structure in which expected types of information are deployed in a conventionally agreed-upon manner. Similarly, in speech events such as doctor–patient interactions, formal lectures, business meetings, church services or blind dates, etc., the participants know when they are in one phase of the activity or in another and behave accordingly. The proper interpretation of a DCU depends critically on its participation in a specific structured discourse text as well as its relationship to the speech event in which it was uttered. Similar prosodically related strings of words will express very different information if used to build the semantic representation of one story embedded in one interactional context rather than another. Therefore, discourse genre unit and speech event information, along with the spatio/temporally located participant structure we call **interaction**, contextually index the semiotic DCUs and operators that make up any spoken, written, gestural, or multimodal discourse event.

In summary, E-DCUs which give information about events in the same discourse context will necessarily present information from the same points of view, empathy status, and modality, and relate to the identical genre-defined and socially constructed interactional frames.

1.2 Discourse operators

In addition to semantic structures which express states of affairs about a DC, utterances may also involve nonpropositional elements which make explicit the nature of links among pieces of information, thereby facilitating proper semantic interpretation. These **discourse operators** modify discourse constituents and may have scope over long stretches of discourse (Schiffrin 1987, this volume; references in Di Eugenio et al. 1997).

Although some metacommunicative propositional utterances such as *As we were saying before we were interrupted* may function as operators as well as expressing propositional content and must be interpreted as a complex structure, most linguistic structures functioning as operators, such as English *yes*, *uh*, *ok*, *but*, *because*, *well*, *so*, *if*,

then, *therefore*, *hello*, *goodbye*, *now*, *or*, *what*, *why*, *and*, *anyway*, *on the other hand*, *by the way*, and any proper name used as a vocative, do not assert information about states of affairs in a context but give information about the state of the discourse and the relation of discourse entities and discourse representations to one another. Discourse operators, while themselves lacking in propositional content, often make explicit the shift in the indices of the content-bearing DCUs. Sometimes that shift is not linguistically encoded at all; body position, eye gaze, and tone of voice may all signal a shift in footing – a shift in interpretive context.

1.3 Segmentation and discourse surface structure

Under the LDM, discourse is segmented maximally. Initiation of a new elementary unit is signaled whenever phonological (i.e. pausal or prosodic) criteria indicate a break, whenever sentential syntactic criteria indicate a clause break (except for a lexically limited set of matrix verbs governing infinitival clauses), and whenever sentential semantics requires a change in any of the contexts (spatial, temporal, modal, etc.) that index the discourse contexts where the events (and in general, states of affairs) are interpreted.[2]

Discourse segmentation is determined by semantic criteria and guided by syntax and intonation. For example, the sentence *I went downtown but Mary stayed home* (discussed in Longacre 1976: 261) is analyzed under the LDM as a three-unit structure consisting of two DCUs (*I went downtown* and *Mary stayed home*) and a discourse operator *but*, a logical connective which asserts the relationship that obtains between two states of affairs, while the utterance *Actually, I slept* expresses a single state of affairs, "speaker slept," which obtains in one context and an attitudinal evaluation of that state of affairs uttered from the point of view of the speaker situated in another. This utterance thus maps into two discourse-level units, the discourse operator *actually* and the E-DCU *I slept*.

2 Complex Discourse Units and Discourse Parsing

In this section, we discuss the rules specifying the syntax and semantics of well-formed discourse structures recursively built from elementary DCUs and develop a typology of higher-level constituents. Discourse operators are peripheral to this undertaking: the central data structure, the **discourse parse tree** (DPT), has propositional DCUs at the leaves.[3] Under the LDM, the DPT is constructed on a DCU-by-DCU basis built up sequentially through a process of discourse parsing. After examining the rules for complex DCU formation, we will briefly consider the DPT construction process.

2.1 Complex discourse units

We distinguish three basic types of higher structures: **coordination**, **subordination**, and **binary** constructions. Nonterminal nodes of the DPT are always one of these, and will be labeled by *C*, *S*, or *B* accordingly.

2.1.1 Coordination structures

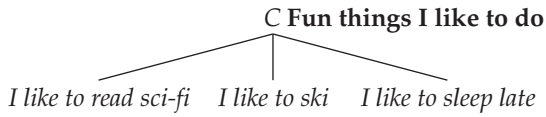
Adding a next item to a list, giving a next episode of a story, beginning a new topic in a conversation when discussion of a previous topic has been concluded, or going on to a next expected activity in a speech event such as a church service can all be analyzed as continuing the development of an ongoing discourse activity. In the DPT such continuing activities are depicted as a sequence of coordinated constituents, i.e. as a nonterminal *C* node immediately dominating arbitrarily many constituents that share a single type. **Lists**, **topic chains**, and **narratives** are common sequential structures.

Consider the simple discourse fragment given in (1):

(1) *I like to read sci-fi. I like to ski and I like to sleep late.*

The structure of (1) can be characterized by the tree given in (2):

(2)



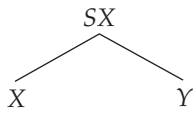
In (2), the first DCU, *I like to read sci-fi*, could be an item on lists of many types such as "What I like to do," "What I do on Tuesdays," "What I like to read," "What people in my family like to do," and so on. When the second DCU is encountered, and the information in the proposition "speaker likes to ski" is compared with the information in the proposition "speaker likes to read sci-fi," a competent language understander using world knowledge would infer that what is being communicated is a list of items of what we could gloss as "fun things the speaker likes to do." This higher-level, more general information, referred to as the **common ground**, is used in the DPT as further specification of the *C* node label.[4] When the third DCU, *I like to sleep late*, is encountered, it is compared in form and meaning to *I like to ski*, a computation of the common ground between DCU 2 and DCU 3 nets the same higher-level common ground "fun things the speaker likes to do" as was computed to obtain between the first two DCUs. This means that all three DCUs are specific instances of the same general list and can be accommodated under the same higher-level node.

2.1.2 Subordination structures

Discourse activities which interrupt the completion of other ongoing activities are treated in a structurally uniform manner. **Elaborations** on a point just made, **digressions** to discuss something else, **asides**, **appositives**, sections of **direct discourse**, or true **interruptions** are all treated as subordinated to activities which continue the development of an ongoing unit, be it a story, a proposal for a course of action, a lecture, or a move in speech event. We also recognize **sentential subordination** which obtains between a matrix clause and its subordinated clause[5] or appositive or parenthetical element[6] as discourse subordinations.

In the general case, the subordinated constituent will be encoded as the right daughter *Y* in an elementary tree such as (3):

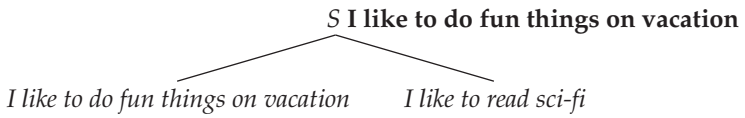
(3)



Notice that the superordinate constituent *X* does not dominate *Y* – the fact that the relation between the two is one of subordination is expressed by the label of the mother node. Unlike the coordination case, where the interpretation of the mother node is computed by conjoining the interpretations of the daughters, the interpretation of structures such as (4) is as in (5). The mother node inherits all the information of its left daughter; the right daughter has no impact whatsoever:

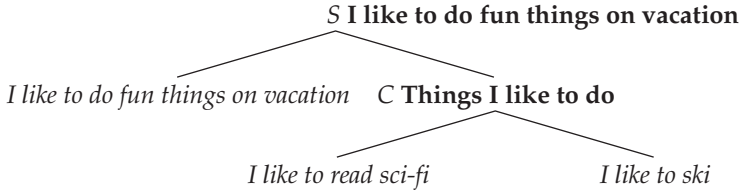
(4) a. *I like to do fun things on vacation*
b. *I like to read sci-fi.*

(5)



Should the discourse continue, *I like to ski*, this new DCU would be coordinated to Y *I like to read sci-fi* under a newly created *C* node interpreted as "Fun things I like to do" as in (6):

(6)

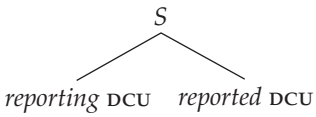


The identical DPT process operates in the case of interruptions. Since no semantic relationship obtains between the sister DCUs, and the newly incoming interrupting sister is breaking off an ongoing discourse activity, the fact that the content of the right sister does not influence the interpretation of the unit it is interrupting is very reasonable. The only relationship between an interrupting and an interrupted constituent is the structural relationship of contiguity.

We will pay special attention to one type of elaboration, which plays an important role in the analysis of the Yiddish anecdote we will be discussing below. **Reported speech and thought** are common in stories, arguments, and other forms of discourse. What is spoken or thought by the character is interpreted relative to an interaction in a story discourse world among characters in that discourse world. The narrator, in asserting a reporting event such as *I said* or *Suzie thought*, which typically is an event on the mainline of the narrative, communicates directly to the story recipients in a context that includes narrator and recipient as participants but which excludes the

characters in the story. Because the reporting DCUs are events on the story mainline and the reported speech or thought interrupts the development of the narrated world by interposing an interaction among other participants, we subordinate reported speech and thought to the DCU of the reporting narrative as shown in (7):

(7)



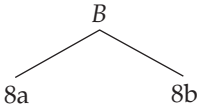
2.1.3 *Binary structures*

Binary structures construct a DCU out of two DCUs commonly joined by an explicit or implicit relation. Semantically, binary relations are very complex. Binary relations hold between two constituents related logically (e.g. *if/then*, *then/if*, *or*, *therefore*), rhetorically, (e.g. *sum up*), or interactionally (e.g. *question/answer*, *warrant/response*, *error/repair*).[7] The discourse parsing of (8):

(8) a. *If John goes to the store*
b. *he'll buy tomatoes*
c. *Otherwise, we'll just have lettuce in the salad.*

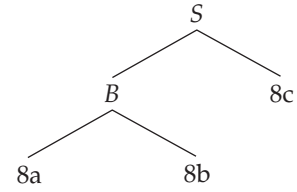
begins with setting up an intrasentential binary node dominating both DCUs in the first sentence:

(9)



When (8c) becomes available, it is subordinated to the *B* node, since at this point it is a digression as shown in (10):

(10)



At this time it is not known how many types of binary relations (and thus how many binary node types) need to be distinguished, though there is no reason to believe that the number of binary discourse structures commonly found in a language, and which should be stipulated in a grammar, would greatly exceed the number of complement types that sentential syntax requires us to differentiate. It is to be expected that different languages may have quite different binary relations (Longacre 1976).

One binary structure deserving special mention is **repair**, which differs from other discourse relations because, instead of an instruction to semantics to create a new

representation or update an existing one, the repair node calls for the removal of information previously added to a representation. Because of repairs, discourse which is syntactically monotonic is semantically nonmonotonic.

2.2 *The discourse parse tree*

From the preceding discussion of the major construction types it is clear that at a high level of abstraction all DPTs can be described by a simple context-free grammar. Elementary DPTs will have either a *C* mother node and two or more daughters, or an *S* or *B* mother node and exactly two daughters.[8] But this is no more than the syntactic skeleton of the grammar. As soon as we annotate the nodes by the semantic interpretation of the constituents, matters become much more complex. The main difference between DPTs and the trees familiar from sentential syntax is that in DPTs we allow attachment only at the right edge: discourse POPs which resume an interrupted constituent will always close off the interrupting (elaborating or otherwise subordinated) constituents and make it impossible to attach (coordinate or subordinate) any subsequent DCUs to them. It is this property of the DPT that we refer to as being **right open**.

It should be emphasized that, together with other computational discourse analysts, by stipulating restrictions on DCU attachment we are making a very strong claim about the structure of discourse. The openness of the right edge makes the DPT in this respect equivalent to the **intention stack** mechanisms proposed by Grosz and Sidner (1986) and the **right frontier** of Webber (1988), as opposed to Reichman's (1985) **context spaces** and Johnson-Laird's (1986) **mental models**, which always remain open and available for incrementation. This restriction permits predictions to be made about the encoding forms of incoming propositions. Any attempt to add propositions to a closed unit will be accompanied by an intonational repair or initiation signal and will receive a syntactic and phonological encoding as a new rather than a resumed unit (see Grosz and Sidner 1986; Polanyi 1988; Hirschberg and Pierrehumbert 1986; Hirschberg and Litman 1987; Webber 1988). The open right edge offers a simple formal mechanism for the analyst to keep track of what is happening at any given moment in a discourse. Ongoing activities that have been interrupted and are expected by the participants to be resumed are all encoded by nodes on the right edge.

2.3 *Discourse parsing*

Suppose a DPT has already been built over the first k DCUs $d_1, \ldots, d_k$. When the sentential component provides a new DCU d_{k+1}, we first determine the relationship of this incoming unit to the immediately preceding DCU d_k. If this is an elaboration relationship, then we attach d_{k+1} as the right sister to d_k at a newly created *S* node, and label this node with the structural and semantic characteristics of d_k. Otherwise, we continue up the open right edge of the DPT, looking for semantic or syntactic matches. When a match is made, we adjoin the newly parsed DCU as a terminal under a higher-level existing or newly created nonterminal node. If no match is made, we adjoin d_{k+1} as the right sister of a newly created *S* node at the bottom of the DPT, assuming that the new DCU is interrupting all ongoing discourse activities.

A DCU which initiates an entirely new discourse activity will be added to the DPT as a daughter of a high-level mother, which may be created especially to close off the old discourse activities and begin the new. In this case, the new node is inserted above the highest existing node in the tree and the new daughter becomes the new right sister of the previous discourse, rendering the entire previously existing tree inaccessible. Less dramatically, a DCU which initiates a discourse activity is often the first utterance of a new constituent, such as a new **move** or **episode** in an ongoing higher level unit such as a **speech event** or **story**. Both stories and speech events (linguistically realized socially meaningful activities; see Hymes 1972) are internally organized, and while the full details of this organization are complex, the highest level of organization is essentially sequential. For example, in a doctor–patient interaction first there is a greeting, followed by a statement of complaint, an examination, discussion of the findings, suggestions for follow-up, and finally, leave-taking. If a DCU (such as the doctor's summary of the findings) begins a new move, the previous moves become structurally inaccessible. Interruptions and other real-world exigencies do not cause the analysis to fail, since they are embedded into the matrix speech event at the moment of occurrence, and the speech event is resumed after the digression is ended. Needless to say, there can be attachment ambiguities, but the problem of finding higher-level discourse units does not appear to be any more complex than in the sentential case, and since our grammar is context-free, the same techniques of ambiguity resolution are applicable.

3 Discourse Interpretation

So far we have addressed two important issues for our theory: (1) what the atomic units of discourse are and (2) what kinds of structures can be built from these elementary units. These are issues for discourse syntax. Now we will turn to discourse semantics and ask how the resulting structures can be interpreted semantically.

3.1 Discourse contexts

Contemporary semantic theory has a great deal to say about isolated propositions, and we believe that a model-theoretic component along the lines of Montague (1973) or Groenendijk and Stokhof (1991) is indispensable for elucidating the meaning of natural language utterances. Yet we find it necessary to use a richer notion of semantic representation both for individual DCUs and for larger structures than is available in standard formal semantic models. In addition to the propositional **content** of a DCU we will also talk of its **context** and use the formal mechanism of **indexation** to express the fundamental dependency of propositional content on context.

To some extent, the importance of context has already been recognized in sentential semantics, especially for lexical items such as indexicals, where interpretation clearly depends on the identity and location of the speaker (Kaplan 1989). There was an attempt in situation semantics (Barwise and Perry 1983) to incorporate spatiotemporal and polarity indices, and a growing recognition in the formal semantics community

that modality plays a very similar role (Roberts 1987; Farkas 1997). Under the LDM the range of contextual categories is considerably broader than generally assumed, and presents a hierarchy (partial ordering) of contexts:

interaction > speech event > genre unit > modality > polarity > point of view.

The LDM semantics is a version of dynamic semantics (Discourse Representation Theory (DRT): Kamp 1981; File Change Semantics (FCS): Heim 1982; Dynamic Logic: Groenendijk and Stokhof 1991), and the graphical similarity between our DC representations and those used in DRT/FCS is intentional. But the top half of the representation, which in these theories is used for keeping track of discourse referents, will in our notation be used to keep track of contextual indices. The change in notation reflects a shift in emphasis. While the central concern of DRT is pronominal reference and the equations between variables that implement coreferentiality, the central concern of the LDM is the setting and resetting of contexts.

In the simplest case, we depict a DC in (11):

(11)

interaction *speech event* *genre unit* *modality* *polarity* *point of view*
e_1 at t_1 e_2 at t_2 . . . e_k at t_k

We treat discourse contexts as purely technical devices of semantics, no more mentally real than variables or generalized quantifiers. For our purposes, discourse contexts are simply intermediate representations between natural language expressions and model structures, much as in DRT. Rather, we talk about the embedding of one discourse world in another, as in the case of reported speech depicted in (12) below:

(12)

indexes of reporting DCU
e_1 at t_1 . . . event of reporting
indexes of DCU *reported*
event(s) reported

In general, discourse contexts can be recursively embedded in one another. They may also be related to one another by logical and other relations. We indicate these relations by arrows running between the related structures.[9]

4 The Explanatory Power of the LDM

In earlier sections of this chapter, we have presented a very brief and superficial overview of the LDM. Now we turn our attention to arguing for the usefulness of the machinery we have proposed. Specifically, in this section we will argue that the LDM allows us to construct a general, independently motivated theory of what *evoked in the discourse* entails. We will build our account on Prince's (1988) exemplary analysis of 1804 clauses from a corpus of Yiddish anecdotes, *Royte pomenantsen* (Olsvanger 1947: 208), "in which the subject is Postposed with a concomitant use of expletive ES."

We use Prince's examples given in (13)–(15) below to illustrate the phenomenon:

(13) *es* is geshtorbn *a raykher goy*.
it is died a rich gentile
A rich gentile died.

(14) *es* veln oyfahteyn *groyse khakhomin fun daytshland* . . .
it will upstand big sages from Germany.
Great sages from Germany will stand up.

(15) *es* geyt epes in vald *a yid*
it goes something in wood a Jew
Some Jew seems to be walking in the woods.

Prince argues that "Postposed subjects of ES-sentences indicate that they do not represent entities which have already been evoked in the discourse" (1988: 184). Her conclusion is well supported by the data given: out of 1804 examples of ES+Subject postposing, there are only two putative counterexamples to this generalization, which both occur in the same story. These counterexamples bring into question the apparently unremarkable idea of what it means *to be evoked in the discourse*.

4.1 Nondiscourse initial Postposed subjects of ES sentences

In the article we are considering, Prince explains that the full NP *the horse and wagon* occurs six times in the text of a single anecdote, *What my father did*.[10] In two cases, the postposed subject in an ES sentence is not "discourse initial in the story" (Prince p. 184):

Prince explains these apparent anomalies as follows:

> The second occurrence[11] [of the phrase in the text] is Postposed [and] is in an interior monologue of the hero – and since, as far as we know, *he* has not spoken about the horse and wagon *recently* it is discourse-initial in his private discussion with *himself*.
>
> The fourth occurrence[12] [of the phrase in the text] is [also] Postposed, but this time it is in his public announcement back in the inn, addressed to the guests, and in that speech-event it is discourse-initial.

> Thus it seems that the generalization is maintained that Postposed subjects of ES-sentences may not represent entities already evoked in the discourse, with the unsurprising caveat that discourses have internal structure and may themselves include sub-discourses in each of which some discourse entity may be new.[13]

Prince's analysis of how these cases differ from the norm is compelling. However, as stated, the explanation of the key data is ad hoc and unrelated to any more systematic linguistic theory. No explanation of what it means for a discourse to have internal structure is given. Let us now turn to a discussion of how the LDM can account for Prince's data within a comprehensive theory of discourse structure.

4.2 Reanalysis of Prince (1988, 1993)

In order to see how Prince's data are treated under the LDM, let us consider a shortened version of the Yiddish anecdote she provides. For readability, we have removed the glosses. We have already segmented the text according to LDM criteria:

> *What my father did*
> (a) A guy once went by an inn. (b) He left his horse and wagon outside (c) and went alone into the inn. (d) Inside the inn, (e) he ordered a couple of eggs (f) or some chicken (g) and ate it. (h) Then he got up (i) to travel further. (j) He goes outside the inn. (k) He looks around. (l) There's no horse and no wagon. (m) He thought, (n) there was probably a thief among the people in the inn (o) that had stolen the horse and wagon. (p) He goes back into the inn (q) and shouts (r) "The horse and wagon should be returned." (s) The thief got scared. (t) He quickly went out (u) and brought back the horse and wagon.

This discourse consists of constituents of various types, including: the List, Elaboration, Sum Up, Subordinate Clause, Operator/Sentence, Interruption, Direct Discourse, Reported Thought, If/Then, Because, Antecedent/Consequent, Yiddish Anecdote, and Written Yiddish Anecdote.

The Written Yiddish Anecdote is a coordinate structure consisting of several coordinated constituents (as a first analysis and based on this one example):

> Yiddish anecdote → (Opening), Orientation, Action, Question, Answer

A Written anecdote involves an Interaction between a Reader and a Modeled Writer in which an Interaction between a Modeled Narrator and Modeled Story Recipient takes place. The rule for Written Yiddish Anecdote consists of the constituents of Yiddish Anecdote plus an initial Title constituent:

> Written Yiddish Anecdote → Title, Yiddish Anecdote.

4.3 DPT of What my father did

Following the rules of discourse segmentation and discourse syntax given above, results in the discourse parse tree for *What my father did* are given in figure 14.1.[14]

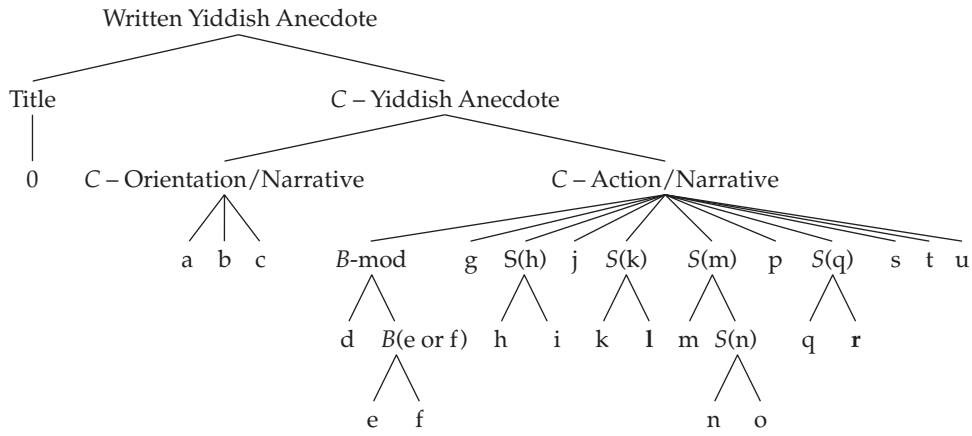


Figure 14.1 DPT for *What my father did*

An examination of the DPT for *What my father did* reveals its hierarchical structure. The events of the narrative mainline are represented as daughters of one coordinate ACTION node, while reported speech, thought and perception are shown as embedded constituents under *S* nodes.

From this purely structural representation, however, it is not clear why the subjects in (l) and (r) are not postposed. For an explanation of this phenomenon we must look further to the semantic representation.

4.4 Evoked in which discourse?

As you will recall, LDM analysis of discourse requires that each DCU be tagged for a number of context variables. If we now examine the semantic representation for this text constructed following the LDM, it is clear that *the horse and wagon* is evoked within the scope of three separate interactional contexts: Interaction 1, involving a Modeled Narrator and a Modeled Story Recipient; Interaction 2, in which the participant set is the Guy who acts as both enunciator of perception and receiver of the enunciation; and Interaction 3, in which the Guy interacts with the crowd at the inn. These three DCUs correspond to DCUs marked (b), (l), and (r). These are the first mention of *horse and wagon* in the Yiddish anecdote we have been examining, and the two putative counterexamples to Prince's generalization.

Since the LDM requires tagging of each DCU for Interactional Context as well as for a host of other context types, our analysis provides the machinery to rephrase Prince's theory of Yiddish expletive ES + Subject Postposing without extending the model at all. The analysis of this under the LDM specifies that any entity mentioned initially in any Interaction Context will be marked in Yiddish as a first mention.

In figure 14.2, we have prepared an informal representation of the semantics of this text.[15]

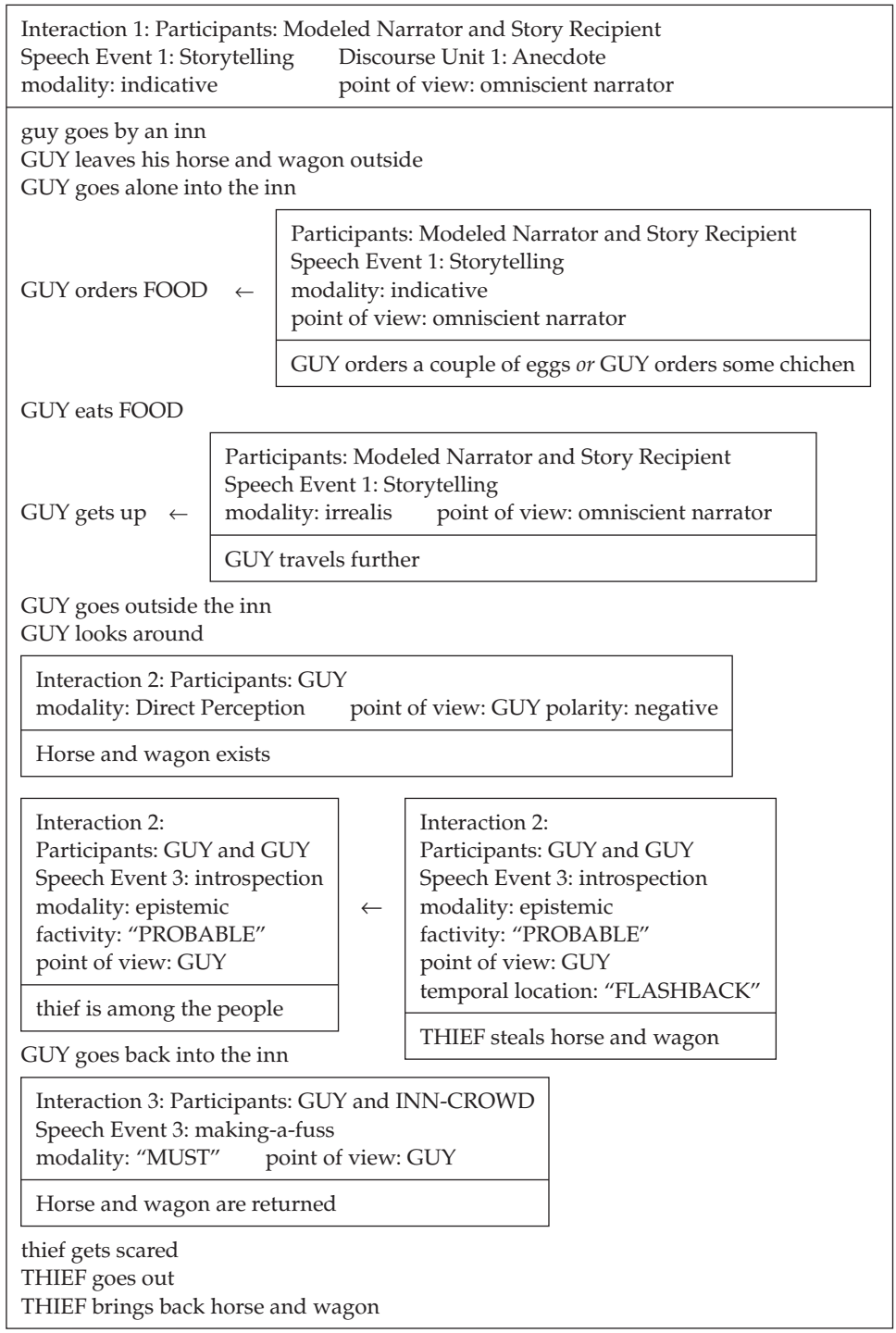


Figure 14.2 Informal semantic representation of *What my father did*

5 Summary and Conclusions

In describing the LDM, we have dealt with discourse as an autonomous linguistic module while, almost paradoxically, insisting that the physical and social identity of the speaker are of crucial importance in discourse interpretation. Where, one might wonder, is the speaker in this theory of discourse? Although accounting for the social concerns, motivations and actions of the speaker, along with the cognitive processing apparatus brought into play during discourse production and reception, lay well beyond the scope of the present discussion, the model of discourse presented here is potentially of use to the working sociolinguist concerned with the analysis and manipulation of complex interactive data, and the psycholinguist interested in understanding the nature of linguistic competence and performance.

For the sociolinguist, we offer analytic machinery which can handle incomplete utterances, hesitations, repairs, interruptions, and changes in social roles and identities (for a survey of work in the interactive and cultural dimensions of language use, see Duranti and Goodwin 1992). The indexing and segmentation requirements allow the sociolinguist to track what is going on in the discourse in a more consistent manner than has been possible previously. In addition, the definition of the DCU permits the form of encoding of propositional (or operator) material to be nonlinguistic. Deictic points, grimaces, or the actions of a machine may all be integrated into the discourse history. The structures of specific instances of a socially recognized speech event can be compared with one another, and far more robust descriptions of the sequences of expected actions can be produced.

To the psycholinguist we offer the opportunity to formulate testable hypotheses about discourse processing and to investigate the relationship between discourse structure, sentence form, and memory limitations in terms of an integrated framework. Although we make no specific cognitive claims and pointedly avoid using psychologically appealing terms such as "mental model," "salience," or "attention," we nonetheless provide a semantic representation in terms of which one can inquire into the mental model any given speaker might build, the differential salience accorded by a speaker to the entities and events in that model, and the degree of attention entities command (see Levelt 1993 for an overview of much relevant work in this area).

In conclusion, we would maintain that the LDM provides a significant set of tools for systematic investigation of discourse-level linguistic phenomena. We have made explicit the nature of our atomic units, the rules for combining them into more complex structures, and the framework in which both simple and constructed units may be interpreted. Linguists, especially the more formally minded, are often held back from the study of discourse by the belief, strongly felt though seldom clearly articulated, that discourse itself is simply an unstructured soup of sentences. Our goal has been to demonstrate that this belief is false: a theoretically well-founded characterization of the domain of rule applicability and the distribution of linguistic structures in discourse is both possible and necessary.

NOTES

1 Paralinguistic signaling includes the use of deictic hand gestures, ad hoc head nods, eye movements, facial expressions, etc. Gestural languages such as American Sign Language and other signed languages encode DCUs in linguistic signs realized nonverbally.

2 This segmentation methodology can operate even if discourse operators are entirely absent from the text. Semantic criteria, alone, will force breaks among the E-DCUs. Similarly, segmentation does not depend on any notion of "coherence" and operates even if the discourse is fragmentary or incoherent.

3 Operators, if present in the text, are treated as clitics attached to propositional hosts.

4 For details of how the computation is done on the lower-level DCUs to create the specification on the higher-level DCU see Polanyi (1985); Caenepeel and Moens (1994); Prüst et al. (1994).

5 Matthiessen and Thompson (1988) build on Halliday's notions of rankshifting (Halliday 1967) and treat subordinated clauses as discourse-embedded.

6 The general constraint in discourse subordination requiring the subordinated element to be to the right of its matrix in the linear ordering of the text (and thus in the discourse parse structure, which is strictly bound to text order) is relaxed in sentential subordination, where the normal order of embedding can be reversed.

7 Longacre (1976) refers to logical and rhetorical structures as "binary paragraphs."

8 If we use different types of parentheses to encode the type of the mother node, () for coordination, [] for subordination, and {} for binary relations, we can describe the language of well-formed DPTs with a single rule $N \rightarrow (NN^{+}) \mid [NN] \mid \{NN\} \mid t$, where N is the only nonterminal (the start symbol) and t is the terminal denoting an elementary DCU.

9 How logical inferences are drawn on the basis of such relations is a matter too complex and digressive to discuss here (for recent work in this direction see Lascarides and Asher 1991, 1993; Asher 1993; Farkas 1997.)

10 The translated shortened form of the anecdote is in section 4.2 below.

11 **es iz nito** *der vogn* **un nit**
It is not here the wagon and not
dos ferdl
the horse
There's no **horse and no wagon**.

12 **es zol teykef Vern**
It shall immediately become
der vogn mith ferdl
the wagon with the horse
The horse and wagon must come back immediately.

13 Emphasis added.

14 For the sake of simplicity the terminal nodes are labeled only with the letter corresponding to the terminal DCU in the segmented text; nonterminals are labeled only with *C*, *S*, or *B* and the simplest indication of semantic extension. Full node labels are much more extensive and allow for the computation on the nonterminal nodes necessary to express recursive DCU formation.

15 In order to make the diagram a bit more easily understood, only particularly relevant contexts are identified. After the first DCU, the contexts which hold for the entire are not repeated.

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