MACROSTRUCTURES

An Interdisciplinary Study of Global Structures
in Discourse, Interaction, and Cognition

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Contents

Preface

In several disciplines of the humanities and the social sciences, various notions of 'global' units and structures play an important role. In the linguistic theory of discourse, for instance, terms like 'topic, "theme, "gist,' or 'upshot' require explicit description. Similarly, in conversation analysis, we must explain what the 'point' of a dialogue is. In microsociology, concerned with the analysis of interaction in social contexts, it seems relevant to account for the fact that action and interaction can be interpreted at several 'levels' in terms of 'global actions.' Finally, in cognitive psychology and artificial intelligence, it has appeared that processing of discourse and interaction (e.g., in production, comprehension, and storage in memory) cannot properly be accounted for without the global organization of complex information.

In this book these various global structures are accounted for in terms of macrostructures. Macrostructures are higher-level semantic or conceptual structures that organize the 'local' microstructures of discourse, interaction, and their cognitive processing. They are distinguished from other global structures of a more schematic nature, which we call superstructures. These are, so to speak, the global 'form' of the macrostructural 'content.'

The theory of macrostructures sketched in this book is the result of research carried out during the last 10 years in the domains of literary theory, text grammar, the general theory of discourse, pragmatics, and the cognitive psychology of discourse processing. This research has been reported in many papers and books in which the theory of macrostructures, first of discourse and later also of speech act sequences and interaction, was gradually

developed. 1However, the topics of these studies prevented us from studying the notion of macrostructure in a more systematic, interdisciplinary, and detailed way. Therefore we decided to resume and further develop the various ideas about macrostructures in a separate monograph. It should be stressed, however, that the theory is still in its infancy, and we do not pretend to give more than a rather rough outline; on some points we are able to be more explicit, whereas on other points we can only formulate rather speculative remarks. Both in sociology and in cognitive psychology, more empirical work is necessary to assess the nature and the role of global structures. In this book we have presented the general but informal outline of the theory and the various concepts and problems involved rather than give a more detailed analysis of macrostructures in a particular type of discourse. In this way we hope to be able to show that the notion of macrostructure is relevant in several disciplines concerned with the account of complex information processing and higher-level interpretation. Moreover, it appears that the basic principles involved in the structures and processing of discourse and (inter-)action at the level of 'global meanings' are essentially the same. Although macrostructures can be abstractly studied, for discourse and interaction, in linguistics and sociology alone, their fundamental 'interpretative' or 'conceptual' nature also requires extensive cognitive analysis. It is at this point where the empirical necessity of macrostructures is most clearly exhibited, viz., as structures that are required in the understanding, organization, and reduction of complex information. Without them, the planning and execution of complex interaction sequences and discourses, as well as their comprehension, memory representation, retrieval, and recall, would not be possible.

Although the term 'macrostructure' is rather recent,'2 similar notions have been used in the various disciplines mentioned previously. Notions such as 'topic' or 'plot' (of a story or drama) occur already in classical poetics and rhetorics, and the study of 'themes' has always been a main concern of literary scholarship. In modern linguistics the notion could only be accounted for as soon as more attention was paid to the semantic structures of discourse, e.g., in so-called text grammars. The same holds for cognitive psychology and

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Fragments of a theory of macrostructures have been worked out by me especially in the following books and papers: 1972, 1973b, 1976b, 1977a, b, e, f, g, 1978e. It should be noted that on many points my original views on macrostructures have been modified in the last few years. One of the major differences has been the distinction between semantic and syntactic macrostructures. The latter are studied in this book under the concept of 'superstructures.'

The first use of the term I know, and which was at the origin of my development of the notion in literary theory, has been made by the German linguist Manfred Bierwisch (Bierwisch, 1965). He thereby referred, though, to global structures of narrative that are called 'superstructures' in this book. The first published uses of the term 'macrostructure' in psychology I am aware of have been made by Bower (1974) and Kintsch (1974), although similar notions have been discussed earlier under different terms (see Chapter 6, footnote 2, p. 203).

artificial intelligence, where models, computer programs, and experiments are now being developed that have macrostructural notions. Of course, in the history of psychology similar concepts have been used, especially in the Gestalt tradition. In a certain sense, this book aims at a theoretical reformulation of some of the ideas of Gestalt psychology, viz., the idea of holistic structures and their specific properties. The limits of one book, however, make it impossible to give a historical analysis of the notion of 'global' structure. Such a study, in several disciplines, would require a book of its own. We shall therefore only refer to more recent uses of the notion.3

Especially in cognitive psychology and artificial intelligence, a number of different but related concepts have been discussed in the recent literature (e.g., schema, frame, script, and scenario). These concepts, which may be applied both in social and in cognitive theories, are taken to be specific, often conventionally determined, organizations of knowledge. It appears that they are important in the formation or comprehension of macrostructures, but it should be emphasized here that they should not be confused with macro structures, which are higher-level structures in processing and representation. Although knowledge is of fundamental importance in all cognitive processes, we have argued that there are also crucial other cognitive factors that determine the production and comprehension of discourse and action (viz., various motivational structures, opinions, attitudes, values, norms, tasks, and interests). The complex mental state which in a certain context determines the actual processes of production or comprehension and which consists of knowledge and these other factors is studied briefly under the term cognitive set. Another notion which is accounted for in terms of macrostructures and which is particularly relevant in the production of action and the comprehension of action discourse in general and stories in particular is the notion of plan. Most of the notions mentioned in this paragraph have received extensive attention in artificial intelligence and in cognitive or social psychology. It has not been possible, however, to discuss the various uses and applications of these notions nor to review critically the respective theories in which they function. Except from short definitions and distinctions formulated in the perspective of our framework, the reader is referred to the studies mentioned in the footnotes for more detailed analyses of these notions.

The presentation of the theory is systematic but informal. Except for a brief discussion of the formal properties of macrorules and macrostructures in

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0ther work on macrostructures will not be extensively discussed and referred to in the text; names and works of relevant authors will be mentioned only in the footnotes. Since this book is not a survey, we have decided (also for esthetic reasons) not to interrupt the text with strings of names and years. All the terms, notions, and theoretical insights that have been borrowed from other authors are acknowledged in the footnotes; this also allows us to add brief comments that are only indirectly relevant to the discussion in the text.

Chapter 2, we have not tried to develop a logical formalism for the semantic structures involved. First of all, such a formalism might present difficulties for noninitiated readers in the disciplines involved. Second, the complexity of current logical proposals for the formal analysis of semantic structures is such that practical_ semantic analysis of longer discourses would not be feasible. Third, many kinds of semantic properties of natural language and action cannot yet be adequately treated in any formal language. Finally, the theory is not yet explicit enough to warrant formalization. For a formal analysis of some of the semantic notions used in this book, the reader is referred to current work in philosophical logic and to some of our other work. For alternative explicit notation and representation, we have to refer to current work in artificial intelligence.4

Although this book has an interdisciplinary orientation, it should be stressed that it has been written by a linguist. This means that the description of interaction and the cognitive processes underlying complex information processing sometimes has a linguistic bias. For the same reason it will be clear to sociologists and psychologists that I am only partially familiar with recent advances in theories and problems in their respective fields. They must decide what the relevance is of a theory of macrostructures in current social and cognitive models, and further development and testing of the theory in the framework of those models will clearly be their task.

It should be noted also that the systematic account of macrostructures in discourse, interaction, and cognition in this book requires a certain amount of repetitiveness, because similar principles are at work in these respective areas. The advantage of this setup is that the chapters are more or less self-contained, such that they can be read more or less independently. Since the book has been written for an interdisciplinary reading public and not only for specialists in the respective fields, this is a further reason why redundancy seems appropriate. For the same reasons we explain in the respective chapters (though briefly and hence not possibly in an adequate way) some of the major theoretical concepts being used in these respective disciplines. This means that the book can be used as an introduction into complex information-processing problems in linguistics psychology, and the social sciences.

We express the hope that this book will be a contribution to the new interdisciplinary developments in the disciplines of the humanities and the social sciences that are now commonly captured under the label of 'cognitive science.' We expect that in this way developments in discourse linguistics will be linked with those in cognitive psychology, artificial intelligence, social psychology, and sociology and that this interaction will lead to mutual

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Besides the reasons given in this paragraph for keeping our investigation informal, we also intentionally want to break with the tradition both in linguistics and psychology to give more status to theoretical explorations by using the kind of formalism that is no more than a symbolic abbreviation. This does not mean that we should not be systematic and explicit though.

fertilization in theory formation. Interdisciplinary collaboration on such important domains as those of discourse, interaction, and cognition has become indispensable.

ACKNOWLEDGMENTS

1 The Concept of Macrostructure

1.1. INTUITIVE NOTIONS OF MACROSTRUCTURE

1.1.1.   The aim of this book is to present a systematic analysis of so-called global structures that play a role in several disciplines of the humanities and the social sciences. Many different terms have been used to denote various kinds of such global structures. In the following chapters, we try to make explicit the notions of global structure involved in the study of discourse, (inter-)action, and cognition. It is necessary to look first at the intuitive concepts and terms handled by language users, as social participants in the interpretation, categorization, and communication of global structures. One of the empirical goals of a theory of global structures is an account of how people show their awareness of such structures by talking about them or by other kinds of metabehavior. Of course, this does not mean that the underlying cognitive processes and representations involved are always 'conscious.' Thus, much of the empirical evidence for the cognitive reality of global structures will have to be assessed in more indirect ways. Nevertheless, there is a sound development in the social sciences to take into account, or even to start from, the explicit indications exhibited by social participants of the ways they interpret and categorize their cognitive and social reality. [1]

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[1]Here we think of the direction in sociology that is called "cognitive sociology" or "ethnomethodology" (see Cicourel, 1973; Garfinkel, 1967; Mehan& Wood, 1975). In general, we may refer to new developments in the methodology of sociology as initiated by Berger and Luckmann (1967) and Phillips (1971), in which the interpretative nature of sociological data is discussed.

Initially, the social scientists will have access only to this kind of intuition, of their own and of their social coparticipants, and the ways it is expressed. There is a more general methodological principle that we shall follow in this book, and it is related to the one indicated above. Whatever the more specific linguistic or sociological concepts of global structures may be, we shall assume that they have a cognitive basis. Thus, language use and behavior may be accounted for in independent theories, but these theories will ultimately be based on a theory of how language users and social participants perceive, interpret, know, memorize, evaluate, plan, produce, etc., their discourses and interactions. In other words, our social behavior-including our communicative verbal interaction-is determined by our interpretations and representations of social "reality." Later chapters show that global structures are the result of very fundamental cognitive principles operating in the ways we process this kind of highly complex information from the social situation.

This fundamentally cognitive approach to the study of global structures should be qualified. Although the basic principles involved in complex information processing are of a cognitive nature, at the same time language use and interaction require an account of their social properties. Thus, the cognitive processes and representations involved do not arbitrarily vary over individuals but are in turn determined by (our knowledge of) social interaction and social structure, in a similar way as cognition develops as a function of biophysiological properties of the organism. Hence, when speaking of the foundations of language use and interaction, we should use the notion of social cognition to account for the fact that our interpretations and representations in this area are essentially conventional:[2] The categories and rules we manipulate are developed under the constraints of all kinds of communicative interaction and cooperation. We have justified beliefs that most other participants use similar categories and rules in most social situations, and such beliefs will even be used to normalize our cognitive processes and representations. [3] We come back to these properties of social

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[2]The notion of "convention" used here is meant to abe a technical one, in the sense of Lewis (1968).

[3]Of course this insight is not new and is well-known in sociology (see, e.g., the relations between "objective" and "subjective" aspects of social structure as discussed in Berger & Luckmann, 1967) and social psychology (e.g., the various features of "social learning" in socialization). Yet, here I mean the development and functioning of the basic cognitive mechanisms proper, and in this sense I believe that cognitive psychology has been "socially" oriented too little, that is, its dominant paradigm (which we may call the "information processing paradigm') seems to have this lack; other orientations, such as some directions in Soviet psychology, have stressed actions as social and socioeconomic ("material') factors of cognitive development and functioning (see Leont'ev, 1972; Vygotsky, 1962). As we see later, recent work on knowledge representation (frames, scripts) recognizes this social aspect of information processing but does not really investigate this basis, for which we should consult ethomethodological studies of everyday life. It should be clear from our remarks that we favor an integration of these various directions of research.

cognition in Chapter 4 in our analysis of global structures in action and interaction. Our point here is that global structures are cognitively based but that the cognitive principles involved develop under social constraints-even if it is obvious that such social constraints again require cognitive interpretation and representation in order to play a functional role in cognitive development.

1.1.2.   With these methodological principles in mind, we may now try to spell out our intuitive understanding of the concept of "global structure" and the ways we denote such structures with terms of natural language.

Our intuitive notion of global structure, first of all, is relative. We discern, interpret, and talk about such structures by distinguishing them from what we call local structures. The clearest manifestation of this distinction appears in the conceptual opposition of whole versus part, which is used in a large number of cognitive activities, from perception [4] to discourse and interaction; that is, we are able to see, treat, interpret, or use many objects or phenomena as "wholes," as cognitive units of some kind, with respect to the various "members," "parts," "sections," or "elements" of these whole objects. Hence, we take global structures to be a kind of (w)holistic structure, and we say that the parts, members, etc., "make up," "constitute," "form," or "compose" them. The intuitive "unity" of a whole then will be determined in terms of spatiotemporal continuity and its cognitive correlates (e.g., coherence) and externally by its distinction from and substitutivity with respect to other (whole) objects. Similarly, a part will be seen, interpreted, used, etc., as an object, property, etc., of another object, even if it may be identified for itself and in relation to other parts of the same whole object. Without analyzing the various properties of parts and wholes further, we assume here that the part-whole relation is an intuitive primitive, which cannot be analyzed into more basic cognitive notions. This relation may show itself in various ways, however, as we have seen, viz., as element-set, member-class, or part-whole.

The distinction between global and local structures should also be construed along another intuitive dimension, that of point of view, that is, we not only have objects or phenomena for which a distinction is made between their parts and their whole but at the same time this distinction may be projected in our cognitive manipulation of such objects. Thus, we may see, look at, focus upon, think of, etc., either the parts or the whole, depending on the "point of view" we take with respect to the object.

One way of showing this point-of-view dimension of the local-global distinction appears in perceptual and cognitive distance. We tend to see an

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[4]See the recent discussion by Miller and Johnson-Laird (1976, 47 ff. and passim) about the perceptual aspects of parts and wholes and their links with language (e.g., lexical hierarchies). These perceptual, and more "general," notions are linked to the hierarchical notion of semantic macrostructure.

object as a whole when looking from farther away than when we look at its parts. The intuitive notion of detail plays a role here: Parts of the whole are distinguished as details when we have a closer look at the object, whereas from a more distant point of view individual details may no longer be perceptible. In the latter case only larger parts or outlines of the object may be visible.

There is a slightly different way of formulating this intuitive distinction, in terms of levels. Instead of saying that we see, interpret, focus upon, etc., a certain object from a certain distance, we may also say that we do all this on various levels, a more specific or particular level, and a more general or abstract level, respectively. In this case the details of the lower, more specific level may be said to be "ignored" at the higher, more general level. From this particular intuitive distinction between global and local structures we see for the first time that the relation between these structures may take the form of certain cognitive operations, of generalization or abstraction on the one hand and of specification or particularization on the other hand. From the various intuitive ways of accounting for the global-local distinction in cognitive information processing, we later take this notion of level as our major starting point. One reason for this strategy is that in the social sciences and their philosophical foundations the notion of level is theoretically well-established: Similar to the intuitive level of "seeing" things, we have the theoretical notion of level of description. We shall also discover that not only for scientific discourse but also for everyday discourse we may speak of different levels of description.

Related to the other notions discussed so far, we finally have the important intuitive distinction based on the dimension of relevance. In this case, the parts or details of the lower, more specific levels are associated with the notion of a lower degree of relevance or importance, whereas the larger parts, the whole, at a more general level are associated with higher degrees of relevance or importance. Thus, details may be abstracted because at a higher level they are less important. Other notions, such as "crucial" or "central", may in that case be used in order to qualify the more general and important levels:

1.1.3. Let us now make these various intuitive manifestations of the local versus global distinction more concrete by giving examples from the various domains we are concerned with in this book. The general domain is that of cognition and in particular that of complex information processing. The more specific domains, both linked to that of cognition, are that of language use and discourse on the one hand and that of action and interaction on the other hand. [5] The choice of these last two domains is not arbitrary. First of all,

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[5]Relevant references about the notions more or less intuitively used here are given in the respective chapters. The same holds for the other notions used below.

they represent two fundamental cognitive functions of the human organism. Second, language and discourse are inherently linked with social action and interaction: When we speak or write, we accomplish certain kinds of social acts, viz. speech acts, which play an important role in social interaction. In both cases complex information processing is involved, and it will be assumed that such complex information processing is not possible without the theoretical and cognitive distinction between local and global structures.

First of all, language use manifests itself in utterances that, as object types, we interpret as discourses or texts of a certain natural language. If more than one speaker is involved in the production of such utterances, we speak of a dialogue or conversation. The theoretical analysis of discourse is the object of analysis in Chapter 2. What we are concerned with here is the fact that language users implicitly and explicity make a distinction between local and global structures of discourse. On the one hand they speak of the details of what was said, on the other hand they use such notions as theme, topic, gist, upshot, or point to characterize the discourse, or larger fragments of it, as a whole. Thus, words and sentences are seen as the parts of the discourse, and the theme or topic is seen as a property of the whole. When people talk about such a theme or topic, at the same time they imply that details of the discourse are disregarded or abstracted from this account at a more general level.- "I don't remember exactly what he said, but the upshot (his point) was..." At the same time these notions intuitively associate with that of relevance or importance: The point is the more relevant, important, central, prominent, or crucial aspect of what was said.

In these examples of notions used in everyday speech to denote global properties of discourse, we observe that the notions mainly pertain to the meaning or content of the discourse and not to the style of expression, the ordering of discourse parts, etc. This means that this kind of notion should be made explicit in semantic terms; to distinguish them from other kinds of global structures, we talk about semantic global structures. It is this type of structure that we try to make explicit in this book in terms of (semantic) macrostructures.

1.1.4.   Besides these semantic global structures we also use terms to denote global structures of discourse and conversation that have a more schematic nature. In that case it is not the global meaning but rather a global schema that is involved, a schema that may be used to order or to assign other structures to the global meanings of the discourse. Notions such as outline, construction, order, and buildup are used in such cases. Schematic structures of this kind maybe of a categorical type (i.e., built up in terms of conventional categories, just as a sentence is built up from syntactic categories). Examples of such schematic global structures are the narrative structure of a story, the argumentative structure of a lecture, or the specific schematic ordering of a

psychological paper. In all those cases we also have intuitive terms in order to denote some of the categories involved, such as introduction, setting, background, development, and conclusion. To distinguish schematic global structures, which pertain to the global "form" of the discourse, from the global meaning structures for which notions such as "theme," "topic," or "gist" are used, we use the specific theoretical term superstructures. [6] In Chapter 3 we try to establish the various links between these two sorts of global structures (i.e., between semantic macrostructures and schematic superstructures).

1.1.5.   Utterances maybe studied not only as manifestations of discourse but also as manifestations of social actions, as speech acts. Both in monologue and in conversation this may involve a sequence of speech acts. Also at this level, which is the object of the discipline of pragmatics, it makes sense to distinguish between local and global structures. The local structure pertains to the individual speech acts and their connections, whereas the global structure pertains to the sequence of speech acts as a whole. Also here we use intuitive terms such as the point or upshot of what was said, or rather done, though not referring to some global meaning but instead to the globalspeech act being performed. Thus, we may locally perform an assertion, followed by a request, but with a whole sequence of (possibly different) speech acts we may also globally perform the speech act of a request, an assertion, or a threat (e.g., in a request letter, a lecture, or a ransom note). In other words, the global structures at this pragmatic level of analysis pertain to the global functions of the utterance. Language users have intuitions about such global pragmatic structures. Thus, for instance in conversation, they may know that, as a whole, the speech acts of the speaker may add up, come down to, or function as a global request or threat. Again, we disregard details and underline the most relevant or important aspect of the utterance when we say that what he essentially did was to promise something.

1.1.6.   Via the notion of speech act and that of global speech act we may now look for more or less similar intuitive distinctions made by social participants between local and global structures in action and interaction in general. The

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[6]This term has been chosen in order to mark clearly the differences between "semantic" and "syntactic" global structures, which are often confused in current discussions of schemata and similar notions. Moreover, the term "superstructure" has no current use in linguistics and psychology. For purists the Greek form "hype rstructures" may have been preferable as a partner for "macro structures," but the term "hype rstructure" has been used already in linguistics to account for (syntactic) structures beyond the sentence level (cf. Palek, 1968). Note,though, that in our earlier work we also often confused semantic macrostructures and syntactic superstructures. To avoid too much heavy jargon, we shall sometimes use the more general notion of schema to denote superstructures of particular kinds if confusion with other types of schemata does not interfere.

distinction makes sense only if we again take on the one hand a sequence of actions and decide whether the sequence as a whole has certain properties. This is the case in all examples of higher-order actions, that is, actions that are performed, as a whole, by performing a sequence of other actions. Many social actions are of this kind, such as taking a train, eating in a restaurant, or going shopping. Such stereotypical social episodes are analyzed later in terms of frames orscripts. We also have global actions that are not inherently social, such as taking breakfast (alone), taking a bath, or repairing one's car. Essential for our discussion here is that social participants are able to handle complex sequences of actions as one global action, that is, they speak about such actions and interpret sequences as one action. The same holds for global interactions: A conversation itself is a case in point, and the same may be said for other kinds of dialogue, such as fights, duelings, interviews, or meetings; in nonverbal interactions, from moving a table together or a marriage to playing a game together. The intuitive idea that participants have about the global action being carried out appears in such questions as: " What are you doing?" "What are you driving at?" What's the idea?", where an observer may well see and understand what actual local action is being carried out but wants to know of which global action it is a constituent.

In actions we very clearly witness several of the intuitive aspects of the local versus global distinction previously discussed: Local actions are constituent parts or sections of global actions; global actions function as unified wholes, which as such in a higher-level sequence may be conditionally related to other global actions; and the constituent actions are indeed less important or more specific than the global action. The difference of level of seeing, interpretation, and description especially plays a role when we want to speak of local and global action. At a certain moment what is being carried out is, by necessity, a local act at the specific level, and this is what the observer during such a moment actually sees and interprets. However, at the same time another global act may be carried out, but only if the previous and the following actions, and hence a whole sequence carried out during a time period, is interpretively taken into account. In other words, the global action can be interpreted only when we change levels (or distance) of interpretation. The same may hold when we comment upon the whole sequence afterward and assign it a global act.

Valuable indications about the global nature of complex (inter-) action also comes from the various cognitive terms necessary to define such actions, such as plan, intention, goal, or purpose. The more precise meaning of these terms as we use them is made clear later; but it is interesting here that a term like plan, for instance, and also terms like blueprint, idea, scheme, design, project, or sketch may be used to program complex future actions. This programming will usually be global, that is, specify a global goal and perhaps major actions, strategies, and results, contrary to a script or scenario that specifies the precise sequence of actions to be carried out.

We may provisionally conclude that social participants indeed have intuitive ideas about the global organization of action, both in production (plans) and in observation and interpretation of action. They are able to make level distinctions and take a sequence of action as one global action.

1.1.7.   From the various examples of distinctions between local and global structures in discourse and interaction we have already seen that the distinction has a clear cognitive basis. Looking at parts or wholes, taking a different point if view, making a distinction between levels, generalizing or abstracting, and finding some things more or less relevant or important are clearly cognitive operations. The same holds for representations of themes or topics, which appear to be semantic, and representations and executions of schemata or plans.

The notion of global structure is more general and, as we said, accounts for certain properties of complex information processing. Also for those cognitive functions that are not treated in detail in this book, global organization is necessary (e.g., in perception and vision, thinking, problem solving, and decision-making). In fact, we have seen that some of the examples previously discussed make use of metaphors borrowed from these functions, especially that of vision. Similar processes are involved in the observation of collections of objects (e.g., furniture or toys), a sequence of events, or a sequence of images. Instead of looking merely at one object or (global) image, we may take more complex wholes as units. In this way our observation of a sequence of events may be interpreted for instance as an "accident." We have seen the same kind of global interpretation previously for sequences of actions. Features, individual local events, or objects in this case may again be disregarded, abstracted from, and hence treated as visual detail with respect to the global outline of the global event, the global object, or the sequence of images as a whole (e.g., the movie).

For the area of thinking, problem solving, and decision making, which are all forms of complex information processing, the local versus global distinction is also intuitively well-known. As for actions in particular, we know that in thoughts, problems, and decisions we have global ideas, designs, plans, or strategies that only pertain to the higher level or major steps in the process, geared toward a major goal. As soon as the process is complex enough, we no longer are able to memorize actively and hence plan all the details of a sequence, so that we have to make rough ideas or plans. Similarly, these global thoughts, ideas, or plans will also be used as control information in the execution of the actual sequence of actions in problem-solving tasks and the consequences of decisions: We may or may not follow our plan, or events may or may not occur according to plan or design.

1.1.8.   From the examples of intuitive terms, notions, and knowledge we have about different cognitive functions, and in particular about language

use, discourse, and action, we may conclude that the "local versus global" distinction in complex information processing is extremely useful if not necessary. From our observations, however, we now should draw conclusions for a proper object of research. We have seen that the local versus global distinction manifests itself in many different ways, so it is necessary to make an analysis that is abstract enough to show the deeper similarities between the notions from the respective areas. This means that we have to establish a common theoretical concept and investigate its empirical basis.

We also need to indicate which current notions, problems, phenomena, etc., in the respective disciplines involved can or should be (better) accounted for in terms of this theoretical concept and how the concept can be linked to other concepts in linguistic, sociological, and cognitive theories. Only if we are able to specify this role of the new theoretical concept, may it be accepted as useful.

1.2. TOWARD A THEORETICAL CONCEPT OF MACROSTRUCTURE

1.2.1.   It is the aim of this book to make the various notions of "global structure" discussed in Section 1.1 more explicit. To do this, we introduced the theoretical notion of macrostructure. Although global structures in discourse, interaction, and cognition may as such have varying empirical properties, we try to provide a common basis for them with the more abstract notion of macrostructure. This means that as soon as we talk about macrostructures of discourse, interaction, and cognition, a theoretical framework will be necessary for each of these domains. A common abstract notion is also necessary to assess the specific aspects of global structures in these various domains. Thus, a grammar, a cognitive process model, and a theory of social interaction will have to account for different kinds of manifestations of "underlying" macrostructures. This does not mean that an abstract notion of macrostructure for these different theories could not as such have an empirical nature. On the contrary, we have observed in the survey of intuitive notions of global structures that most of them appear to have a cognitive base. This means that although the notion of macrostructure is a theoretical notion, we assume that it has a psychologically "real" correlate, which may be empirically assessed. In other words, complex information processing at the cognitive level is accounted for in terms of macrooperations and macrostructures in conceptual representations. Typical for the cognitive model, then, is the further analysis of how such operations are applied and how macrostructures are formed, transformed, stored in memory, retrieved and (re-)produced. Also, a cognitive model has to specify how maerostructures organize complex information in various domains,

such as vision, language, thinking, and action. Finally, the cognitive model should specify how macrostructures and macrooperations are influenced by other cognitive factors, such as knowledge, beliefs, opinions, attitudes, wishes, wants, tasks, goal, values, and norms.

In a *theory of discourse* the notion of macrostructure has a more limited function. It is used to account for the various notions of global meaning, such as topic, theme, or gist. This implies that macrostructures in discourse are semantic objects. According to the principles of explicit semantics, this means that rules of some kind must be formulated to relate meanings of words and sentences (i.e., local structures) to the semantic macro structures. Next, macrostructures in a theory of discourse are necessary to account for the intuitive notion of *coherence*: A discourse is coherent not only at the local level (e.g., by pairwise connections between sentences) but also at the global level. Notions such as global meaning, global reference, topic, or theme are intimately related, and macrostructures are needed to make these relations explicit. Finally, language use and discourse have all kinds of other properties for which a macrostructural analysis is necessary. First of all, language users are able to make *abstracts* or *summaries* of discourses. Intuitively, such summaries are discourses that express the global meaning or main topics of the summarized discourse, so that the summary relation between two discourses should also be formulated in terms of macro structures. The same holds for all kinds of summarizing features of the discourse itself, such as *thematical sentences, titles* and *subtitles, conclusions*, and *key words.*

The establishment of explicit links between semantic macrostructures and schematic *superstructures* is also important for a theory of discourse. Thus, we want to know how the global content of a story is related to the narrative schema, what constraints upon the macrostructure are determined by such a schema, or how such schemata in turn may develop from "fixed" macrostructures. Finally, we should investigate whether macrostructures in discourse are different for different types of discourse and hence for different types of schematic structures: Intuitively speaking we know that what is more important or more thematical in a narrative may not be in a police report or a psychological paper.

It is the *cognitive model*, as we saw previously, that should account for the various cognitive aspects of discourse processing at this macrostructural level: production, reading and comprehension, storage in memory, retrieval, reproduction, and hence recall and recognition of textual information. By using a sufficiently abstract and semantic notion of macrostructure both in the theory of discourse and in the cognitive model of discourse processing we hope to establish the necessary interdisciplinary coherence between these different accounts of discourse structures.

Finally, macrostructures in the *theory of social interaction* are needed to account for the fact that participants plan, see, interpret, and memorize

actions both locally and globally. In communicative verbal interaction, first of all, this means that we speak of *pragmatic macrostructures* to account for the *global speech* act being carried out by a sequence of speech acts. More important for a general theory of interaction, however, is the fact that various kinds of *social structures*, such as the social context and frames of interaction, rules, convention, norms, and the various categories of participants like functions or roles, may be linked to global actions and not always to individual local actions. Thus, teachers at school only have the obligation to teach globally speaking; that is, many of the individual actions performed by them in the school situation need not be teaching activities as such. Macrostructures of interaction not only allow global planning and control of future and actual action sequences but also guarantee their coherence and their appropriate functioning in the social context. All this requires a cognitive basis, in which the planning and interpretation of action and interaction is accounted for. Just like discourse, action is an intensional (conceptual) object: We assign "meaning" to it on the basis of observable doings; we ascribe actions to persons in the same way as we assign meanings to observable utterances. Notions such as intention, purpose, and decision are involved here, which of course have a cognitive nature for which a proper cognitive model should be elaborated. It is also "via" cognition that macrostructures of action have their specific social role.

From these few examples it may have become clear that there is a great number of phenomena for which a theoretical notion of macrostructure can play an important descriptive and explanatory role. To make such an interdisciplinary account more coherent, however, we should first try to systematize and to make the various properties that macrostructures are supposed to have a little more precise. In the subsequent chapters we specify these for the respective theories and models of discourse, cognition, and interaction.

1.2.2.   From the respective intuitive uses of "global" notions we only select and systematize some to be made explicit in terms of macrostructures. One of the more permanent properties of these notions, thus, appears to be the semantic nature of global structures, intimately linked with a *conceptual cognitive* basis for such structures. We now limit the theoretical notion of macrostructure to such semantic or conceptual structures. This means that the notion is relevant only for the domain of *information processing*. All kinds of natural objects, such as trees, faces, or rivers, will therefore not be assigned macrostructures *as such* but only the processes of visual information processing for which they are external stimuli. The part-whole relation, therefore, is not taken as a direct manifestation of the relevance of macrostructures. Conversely, all those objects and processes that are inherently informational, such as language and action, may be analyzed in

terms of macrostructures, as well as all cognitive processes and representations. Yet, in the domain of information processing we only take, as suggested previously, the semantic or conceptual aspects. This means for instance that all kinds of *structural* information will not as such receive a macrostructural analysis. Thus, the fact that a sentence is composed from syntactic categories does not mean that the "global sentence structure" is taken as a kind of macrostructure.

This does not mean that at the "syntactic" level we do not have structures which have a global nature and which may be distinguished from local structures at a "lower" or more "detailed" level. We have given the example of the overall schema of stores or psychological papers. Given the different nature and role of such overall structures, however, we use a specific notion for them, that of schematic *superstructure*. One of the crucial differences between macrostructures and superstructures is not only that the first are semantic and the second are schematic or "structural" but also that macrostructures *necessarily* characterize any kind of complex information processing, whereas superstructures have a more conventional nature.

Another restriction we would like to respect in the establishment of a specific notion of macrostructure has already been expressed several times, its relevance in *complex* information processing. Hence, the meaning of one word, phrase or, clause, as well as planning or interpretation of one single, basic action, and the various cognitive processes involved for these and other relatively simple cognitive functions, such as object recognition, do not require macrostructural analysis. Macrostructures are theoretically relevant especially or only for *complex* and *hypercomplex* information, such as discourse, conversation, action sequences, complex thinking and problem solving, complex vision of scenes and episodes or their representations, coordination tasks, learning, and attitude formation and change and their cognitive correlates. Although the distinction between relatively simple and more complex information is gradual, there are empirical properties of information processing that seem to indicate where macrostructures are relevant (e.g., constraints of *short-term memory* capacity). Roughly speaking, then, we call information "complex" as soon as it goes beyond the storage and process capacities of short-term memory: A word, phrase, clause, simple action, single object, etc., may all be interpreted on the basis of structural features that can be handled by short-term memory. For complex information, further organization and representation in long-term memory becomes necessary. In Chapter 6, we spell out these aspects of cognitive processing; here we merely want to indicate provisionally what the empirical basis of the distinction between simple and complex information might be.

It has been indicated before that the notion of global structure is *relative* and that it may be defined only with respect to some notion like *local*

structure. The same should hold for the theoretical notion of macrostructure. The overall semantic structure of complex information therefore should be defined relative to other (semantic) structures (viz., those at the more "simple" or "local" level, such as the meanings of words, phrases, clauses, and simple actions). For practical reasons we shall use the term *(semantic) microstructure* for this kind of local information. The importance of such a notion is that without it we cannot distinguish, as such, what macrostructures are: Macrostructures are global semantic information only relative to the microstructures of discourse, cognition, and interaction. In other words, for different discourses or interaction sequences, the "same" type of information may function either as microstructure or as macrostructure, depending on its semantic role in the whole.

It has been suggested before that the intuitive notion that comes close to the theoretical distinction between macrostructures and microstructures is based on the term *level*. Hence, for any kind of complex semantic information we do *not* distinguish between macro- and microinformation at the *same* level (e.g., in terms of parts or sections or fragments versus the whole but in terms of different *levels* of description, processing, interpretation, planning, etc.). We say that macrostructures characterize the *higher* or more *abstract* levels of semantic information and information processing. It later appears that the relative nature of macrostructures requires the possibility of having *several* macrostructural levels.

The idea of representing macrostructures at a different, "higher," level incorporates the various intuitive ideas according to which global information is conceptually "farther" from the actual phenomena, that the "same facts" are represented but from a larger and hence more general or abstract point of view. The macrostructure thus has to represent what is the major, more relevant, more general information *out* of complex information as represented at the more concrete microlevel. Both the notion of *description level* and that of *representation level* appears to play an important role in discourse, cognition, and action.

Finally, the level approach distinguishing macrostructures and microstructures in complex information makes it possible to take an important theoretical step next. Different levels are not independent but are systematically *related*. Thus, it is necessary to define rules, operations, transformations, or other mapping rules to relate the respective levels of microstructures and macrostructures. We have observed earlier that this kind of relation is necessary in any type of explicit semantics. Particularly we must show that a macrostructure may be *derived* or *inferred* from microstructures.

1.2.3.   Now that we have a more precise, though still provisional, idea about what we mean by the notion of "macrostructures", which allows us to specify

them for the various domains and phenomena to be treated later, we should also spell out the various *functions* macrostructures are supposed to have in complex information processing.

The first function of macrostructures is to *organize* complex (micro)-information. Without them we would only be able to have a large number of links between information units at the local level and not be able to form larger chunks that have their proper meaning and function. We would not have a means to assess that all the units at the microlevel somehow "belong together," as is the case when we assign a macrostructural unit to them at a higher level of description. A particular and important case of this kind of semantic organization is (global) *coherence*: Due to macro structures, discourses, conversations, and action sequences are planned and understood as coherent wholes and hence as a unit that may as such be identified and distinguished from other, similar, objects. Without the macrostructurally formulated notion of coherence, it would not be possible to distinguish one discourse from a following discourse nor one action sequence from another action sequence. All this has of course important cognitive implications: Complex information from discourse, episodes, action sequences, etc., may be organized in memory due to macrostructural information. Without this kind of global organization in memory, retrieval and hence use of complex information would be unthinkable.

At this point we may mention the second major function of macrostructures, the *reduction* of complex information. Even if it would be possible to organize our plans, interpretations, or representations for complex information, we also need a way of effectively handling this organized information. For all cognitive operations this requires reduction of complex information. Macrostructures are, as such, representations of this reduced information. We have seen that they should feature the more important, relevant, abstract, or general information from a complex information unit. This is possible because microinformation is "disregarded." Our task therefore is to define the relations between the microlevels and the rnacrolevels in terms of various *reduction rules*, which we call *macrorules*.

The organizational and reductional functions of macrostructures may have a number of correlated functions. We have seen that *storage* of complex information may become *efficient* in this way, so that individuals are able to retrieve fragments of complex information in a strategically adequate way to accomplish a great variety of tasks: recall, recognition, question answering, problem solving, summarizing, paraphrasing, and so on. In other words, macrostructures that have organized and reduced semantic information allow the adequate use of such information. Not only do they serve as retrieval cues for microinformation but in many cases only global information is needed for subsequent tasks. When we want to summarize a discourse or give a description of some complex event or action, we only need

to give the most important information. Fast and efficient processing of complex information in cognition, communication, and interaction therefore mainly takes place at the macrostructural level. This holds not only in processes of understanding but also in production and planning, control, and execution of very complex tasks.

Although the organizational and reductive functions of macrostructures are fundamental for a processing model, it should be emphasized in general that macrostructures have an essential *semantic* function. They define higherlevel or global meaning derived from lower-level meanings. This process of derivation may involve the *construction* of *new* meaning (i.e., meaning that is not a property of the individual constitutive parts). Hence, as their crucial function, macrostructures allow additional ways of *comprehension* for complex information.

Although these respective functions need further specification in a cognitive model, we may provisionally conclude that complex semantic information processing is impossible without a concept of macrostructure that has such functions. We illustrate this thesis in detail in the analysis of discourse and complex action and the cognitive processes involved in these kinds of behavior. Apart from this contribution to a general theory of complex information processing, the notion of macrostructure appears to play a role in the description and explanation of many phenomena of discourse and interaction, such as coherence, thematization, relevance assignment, and global planning and interpretation.

1.3. PROBLEMS AROUND A REPRESENTATION FORMAT FOR SEMANTIC (MACRO-)STRUCTURES

1.3.1.   An explicit description of semantic macrostructures should be given in a formal language. In linguistics ("formal grammar'l and philosphy, the formal language used most widely has been the predicate calculus and its variations (e.g., as used in current modal logics). In psychology, simplified forms of this predicate calculus have been used to represent conceptual structures and also all kinds of graphical representations.

Although the explicitness of the theory of macrostructures could certainly be enhanced by formal representations of some kind and although it is wellknown that the status of theory formation in linguistics and psychology greatly depends on formalization, we have decided to keep the theory more or *less informal*. This does *not* mean, however, that its presentation will not be *systematic*: Terms, rules, and principles are defined as precisely as possible, whereas semantic (macro-) structures themselves are represented in a more or less unambiguous variant of English.

Some of the reasons for this decision have been given in the Preface. On the one hand, we need a more or less systematic theory before formalization-in a strict sense of that term-is possible and useful. On the other hand, current logical languages are still far from perfect in order to represent semantic information.[7] Since their complexity usually increases with their adequacy, formal representation of whole texts is nearly unfeasible at the moment.

Similar remarks may be made about other explicit systems of representations (e.g., those used in artificial intelligence). These have the additional problem of being only semiformal; they do not have an explicit syntax, let alone a precise system of interpretation rules (semantics). Moreover, many subtle semantic structures cannot be accounted for in these graphical or network types of representation. [8]

To keep this book readable for students from various disciplines and not to link its validity to some current but not generally accepted and certainly quickly changeable system of formal representation, natural language must do, though at some points it is enriched by a highly simplified shorthand notation for semantic structures.

The semantic structures defining texts, action, and cognition, both at the micro- and the macrolevel, are given in terms of *propositions*. The choice of the proposition as the basic unit of semantic structures is not motivated

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[7]There are far too many logical approaches to natural language to give full credit to them all here. Investigations in this domain have come mostly from formal (logical) semantics and have focused on the explication of semantic structures. See the following readers for'this approach: Hintikka, Sttppes, and Moravcsik (1973) and Keenan (1975a). A more complex system, also involving formalization of natural language syntax in terms of "categorial grammar." has been devised by Montague and his followers (Cresswell, 1973; Montague, 1974).

In the latter system explicit categorial representations of the syntax are linked with a semantic interpretation given in terms of an intensional logic. At present this system is probably the most explicit model for natural language, but its extreme complexity (and its actual fragmentary nature) only allows application in the description of simple sentences.

For formal representations of certain discourse structures we may refer to van Dijk (1973a, 1977a) and to references given in Chapter 2. Logical formalism in psychology and artificial intelligence, often of a rather simplified kind, may be found in the literature on inference making and reasoning, in discourse processing models (Frederiksen, 1975a; Kintsch, 1974) and in perception semantics (Miller & Johnson-Laird, 1976). Since predicate logical models are also well-known in other disciplines, our simplified notation for atomic propositions are roughly based on these systems of representation.

[8]For a critical discussion of this kind of representation, see Woods (1975). Among various notational systems, which are sometimes fomally equivalent, we may especially mention those of the La Jolla group (Norman & Rumelhart, 1975) and the Yale group (Schank & Abelson, 1977, and other references given there). It is not possible here to spell out the varous formal and empirical (linguistic) difficulties of these sometimes highly sophisticated systems, devised mainly for computer implementations. The drawbacks of these systems however are often counterbalanced by the obvious successes they have had in the explicit (computer) processing of simple discourse types. Moreover, there are certain basic common properties to those systems that appear in our representation of FACTS.

further here: It has found wide acceptance in several disciplines. Besides a system of propositional representation we shall also use a more complex unit of semantic representation, that of FACTS. As we see following, FACTS may be taken as conceptual units that assign hierarchical structure to sets of propositions. Moreover, FACTS are the semantic units that correspond to units of expression such as clauses and sentences.

1.3.2.   A propositional representation of semantic structures requires an analysis of the internal structures of propositions as well as an analysis of the relations between propositions in sequences or other larger units of representation. Neither of these can be given here: They would require booklength treatment. This is one of the tasks of a formal grammar. We therefore briefly summarize the major structural features of propositions and introduce a simplified notation for those features.

The central element of a proposition is an *n*-place *predicate*. We represent these predicates simply by italicized expressions of English, mostly nouns and verbs. A predicate is usally interpreted[9] as a property (a one-place predicate) of or as a relation between individual objects. These individual objects are represented by the respective *arguments* of the proposition. These arguments are ordered. In our simplified notation system, they are written in parentheses and follow the predicate expression: *loves (John, Sheila)* and *gives to (Peter, book, Laura).* For various reasons, e.g., to be able to represent pronouns and referential identity of expressions between propositions, in general arguments are represented by constants (names), such as proper names or constant letters (x1, x2; . . . , y1, y2, . . . ; or *a, b, c,* . . .). Referring expressions of natural language, such as a boy, in fact also involve a predicate: *boy*(x1). This means that sentences expressing several propositions require higher-order representations (e.g., in terms of FACTS, see following) or at least representation in terms of *compound propositions* constructed with connectives: [boy(xl)] *and* [loves(Sheila, x,)]. For these connectives we simply use expressions of English (because logical connectives are only indirectly and partially linked to those in natural language). [10]

Relations between arguments may be of various functional types; that is, the arguments have different functions with respect to the predicate. They may be Agents, Patients, Instruments, Sources, Goals, etc., as described in

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[9]The notion of 'interpretation' used here is that of referential or extensional interpretation, which links expressions with referents or denotata in some possible world. The assignment of 'meanings' to expressions, as we know it from linguistics and psychology, is called 'intensional' interpretation. Formally speaking, extensional interpretation depends on intensional interpretation: To know what an expression refers to we have to know what it means. For further analysis of these (formal) semantic notions, see the references given in footnote 7.

[10]For a discussion and further references about the properties of formal and natural connectives, see van Dijk (1977a,d).

linguistic case grammars and functional grammars and in dependency systems in artificial intelligence.[11] There is no standard representation format of these functions in any logical formal language, and therefore we do not represent these various functions in the propositions themselves but rather in the more complex FACT representation system that follows. This means that the propositions we use are of the *atomic* type; they denote only the most elementary properties of facts. The same holds for the representation of adjectives and adverbs: They are not represented within one proposition but in a compound proposition or FACT.

Besides arguments and predicates a proposition is taken to consist also of one or more *modal* categories, modifying the proposition as a whole. One of the obvious propositional modifiers is *tense*, represented in the example just given by the morpheme *s* after *love*. Instead, then, we may write: PRES[love(x,, xz)]. The same obtains for other tenses and for compound tenses. Examples of other modalities are: *it is necessary that*, *it is possible that*, and *it is known that*. As soon as arguments are involved in these modalities (e.g., *John knows that ...*), they may again be represented as predicates. In that case, propositions are embedded within propositions: PRES[*know(John, p1)*], where pt is another (atomic) proposition. As said before though, compound/ complex propositions may also be accounted for in terms of FACTS, such that the functional relations involved can be better expressed.

It is apparent that these few remarks and the extremely simplified notation system for propositions are far from adequate. This book cannot give a theory of semantic representations, however; only the main features of propositions are relevant for our discussion.

Finally, note that the propositional format holds both for micro- and macrostructures: It represents semantic or conceptual information in general, so we do not need a separate representation system for the "contents" of macrostructures, only for their overall organization.

1.3.3.   In both linguistic and artificial intelligence analyses of meaning, attempts have been made to establish primitives of meaning, i.e., "atomic predicates" that are the elementary components of the meanings we express in

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[11]So-called case grammars have been initiated especially in the work of Fillmore (1968). See also Anderson (1971) and Heger and Petofi (1977). A related functional grammar. Nhich has functional categories both in the semantics and the syntax, has been elaborated by Dik (1978).

Several representation systems in psychology and artificial intelligence have been inspired by case grammar or Halliday's functional (systemic) grammar (Halliday, 1967); see Winograd (1972). Schank's conceptual dependency system is also based on case-like notions (Schank, 1972; Schank & Abelson, 1977).

natural language(s) and manipulate in the various conceptual processes and representations.[12] These primitives are usually denoting basic aspects of the naive perception and understanding of the physical and biopsychological worlds such as spatiotemporal coordinates, movement, causation, states of mind, and communication. Whatever the practical success of these attempts, it should be stressed that no proposed system is semantically adequate as long as it cannot be demonstrated that all composite meanings of natural language can be analyzed in this way. One of the major problems is the representation of the semantic differences existing between predicates that have been represented partially in terms of atomic predicates. There are many meaning distinctions between different kinds of speaking, eating, or traveling, and these differences should of course also be analyzed.

For our purposes we do not attempt such a microsemantic analysis because (1) the aim of this book is not the analysis of word and sentence meanings; (2) the attempt at this moment would be necessarily ad hoc; and, (3) more important, it is doubtful if the understanding of word meaning always requires further analysis.

It is obvious that language users in many cases can or even do analyze meanings into more elementary components, but this does not mean that they do not manipulate the composite word meanings as such. Their conceptual system also involves representations of such (composite) word meanings; otherwise they would be unable to understand words and phrases.[13] Further analysis (if needed) is drawn from their knowledge of the world, but it remains to be assessed how much of this knowledge is actually processed in the understanding of words, phrases, sentences, or discourse. We take a flexible position in this book on this important cognitive problem: As soon as the understanding of discourse and action in terms of their macrostructures requires further analysis of meanings into more basic semantic components, we specify these components, ad hoc, in terms of existing (English) predicates. Of course this approach is theoretically inadequate, but for practical purposes it must do, and it makes no sense to develop a formal representation system for atomic predicates that at the moment would be necessarily ad hoc. Our theoretical analysis of macrostructures does not hinge upon this issue anyway. This does not mean that attempts at establishing a system of atomic predicates, in linguistics and in cognitive psychology or artificial intelligence, are not important or should not be pursued further.

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[12]For a recent discussion of the analysis of meanings into primitives, see Lyons (1977). Componential analysis in artificial intelligence has mainly been propagated by Schank (1972, 1975; see also Schank & Abelson, 1977).

[13]In Kintsch (1974) there is some experimental evidence for the claim that language users do not always analyze meanings into more primitive components.

1.3.4.   FACTS. To represent meanings of words, sentences, or discourses or in general the conceptual structures playing a role in understanding, action, and memory, our simple propositional format should be enriched with an additional type of representation. A propositional analysis, especially the one formulated in terms of any existing predicate logical language, merely accounts for certain aspects of meaning. A proposition represents certain aspects of what is true (or false) in a certain situation (i.e., in a possible world at a certain moment or period of time). Predicates of such a proposition represent properties of individuals or relations between them. However, the classical proposition format does not account for (1) the precise relations befween propositions as they are expressed by a sentence or a discourse; and (2) the *functional* relations between arguments of a formula. These relations are usually represented only by the ordering of the argument sequence, with the tacit assumption that the order of arguments in a natural language sentence is mapped into the ordering of the arguments in the logical formula. Of course, such an approach is inadequate, because it completely disregards the various "roles" the arguments may have in the sentence.

In linguistics there have been attempts to add this kind of functional category, expressed by word order, case endings, prepositions, and specific morphemes, in the syntax and/or semantics of the grammar.'4 In the predicate logical approach to semantics, *labeling* argument places in terms of their functional relations has been tried. These approaches have been taken over, in various forms, in cognitive psychology and artificial intelligence.

However, no complete and formally adequate system of functional categories ("cases") exists at the moment, and there are many theoretical and empirical problems in the selection of appropriate categories and rules for their combination. Yet, that such a functional analysis is necessary both in linguistics and in models of conceptual processing and representation is obvious. Without trying to develop a system of our own, we shall simply establish a modest format for the representation of such functional relations. However, some further preliminary remarks are necessary about the rationale of such a representation format.

We remarked previously that propositions may represent certain aspects of "what is the case" in a certain situation: individuals involved, their properties and their relations. However, there is an important intuitive way of establishing cognitive units that correspond to what we usually call an (elementary) situation or state, event or action. Both in perception and in understanding discourse and action, we segment reality or represented reality into chunks that we often call facts. Such facts may be rather simple, such as "Mary being ill" or "Peter calling his dog," but they may also be more

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[14]See the references given in footnote 11.

complex, such as "The happy boy kissing the blonde girl on her cheek in the backseat of his car," and still more complex facts. The complexity of the fact grows as soon as there are more participants, more modifiers of both the event or action itself, or more modalities applying to the fact as a whole. Often, we may have a visual representation of such a fact. Still more important is the nonarbitrary representation of such facts in natural language: We usually use one *clause* (or simple sentence) to represent such a fact. As soon as we use more clauses, the fact becomes complex: Facts are connected to other facts, e.g., by various conditional relations, or clauses build "complex facts", where some fact is "embedded" in another fact.

Facts however are not simply a characteristic of reality but a result of our way of seeing, interpreting, and representing that reality. In the example of the kissing scene given previously, we may easily isolate the fact that the boy was happy, that the girl was blonde, or that both the boy and the girl were sitting in the backseat of a car. This isolation may be represented by different clauses or sentences in a discourse and, at the same time, by a different *speech act* (viz., two or more *assertions*). In this case, the speaker may signal to the hearer that he should not represent *one*, more complex, fact but a *sequence* or combination of facts. Of course, in further processing these different facts may be collapsed in the representation of one fact again.

Now, we assume that conceptual representations should not only be given in terms of propositions but also contain fact representations. Such cognitive fact representations are called FACTS,[15] in order to distinguish them from their real-world referential correlates. A FACT, thus, is a cognitive representation of one state, event, process, or action. It may usually be expressed by a simple sentence or clause or by a complex sentence with an embedded clause, where the embedded clause has a function in the main clause. In the latter case, we should also allow the existence of complex FACTS.

A representation of a whole scene, episode, discourse, or movie, consists of a *FACT sequence*. A FACT-sequence, as we see in more detail in Chapter 2, must be *connected **and** coherent*. This means, among other things, that each FACT must be conditionally related to another FACT. Also at a more global level the FACT-sequence must be coherent (e.g., involve identical participants or global actions or events). At this point the macrostructures appear to play an important role.

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[15]The notion of FACT as it is understood here has been given provisional discussion in van Dijk (1978b). Similar cognitive notions (e.g., 'event') have been used before as some form of processing units (see, e.g., Bransford & Franks, 1972; Frederiksen, 1977). From our discussion it may have become clear though that our theoretical notion of FACT differs from those other notions.

What is being said for the FACT representation of sentences also holds for that of macrostructures. In other words, we also have to speak about *MACROFACTS* to account for the comprehension and representation of global events and actions, both in reality and "in" discourse.

Not any conceptual structure may be a FACT. A FACT should meet a number-of conditions spelled out previously. Primarily a FACT should represent the functional relationships between participants involved in a fact. Hence, we need a set of *categories* of participants, such as the usual categories of *Agent, Patient, Goal, Object, Beneficiary*, or *Instrument*. As noted earlier, we do not theorize about the length of the list of those categories nor about their respective adequacy for the representation of fundamental roles holding in reality or "in" sentences. Besides the *Participant* major category, we need the central categories of *State, Event, Action,* and *Process,* each also taken as primitives, although an action is a particular kind of event and an event a particular "conception" of a process. Finally, the State, Event, Action, or Process must be occurring "somewhere", i.e., in a Possible world (*World*), at a certain moment or period of time (*Time*), and at a certain place, trajectory, etc. (*Location*). Finally, each of the categories may have one or more *Modifiers*. These sometimes are embedded FACTS (e.g., when it is indicated that a certain event takes place during another event or when one of the participants is identified by an action it was involved in).

The approximate representation for the kissing scene we have been observing before would then be as in Fig. 1.1. Although the representation can be given in different ways and although other categories or predicates may be used, it gives an impression of the *organizational* importance of facts:

Action: Kiss(x1, x2)
      Participants
             -Agent: boy(x1)
                    Mod: happy(x1)
             -Patient: girl(x2)
                    Mod: blonde(X2)
             -Goal: cheek(X3)
                    Mod: have(x2, x3)
      World: real world(=wo)
      Time: PAST
      Place: backseat(x4)
      Mod: have(x5x4) and car(x1, x5)

FIG. 1.1.

This averagely complex FACT organizes at least 11 atomic propositions and several nonexpressed propositions (real world, etc.). We also see that a FACT has a *schematic* structure. We assume that this schematic structure is cognitively relevant and that it is used in any kind of comprehension or representation activity. We obtain much (propositional or visual) information but immediately try to organize this information into standard format (viz., FACTS). We return to these cognitive aspects of FACTS in Chapter 6.

Although at the theoretical level the notion of FACT solves many of the semantic problems we have encountered in the propositional representation of events or sentences, we should be aware of the point that the graphical representation is, formally speaking, ad hoc. If the graph is an "expression" of a formal semantic language, each of its nodes and connecting lines and each of the categories would require a formal semantic interpretation. We would need to know the exact difference between Object and Patient, between Goal or Destination, between Instrument or Agent, etc. No such semantics is available and since we are not providing one, we must work with a rather intuitive schematization of atomic propositions into FACTS as well as with provisional functional categories.

Note that the terminals of the FACT-schema are filled with the atomic propositions we have analyzed from the complex sentence. They are so to speak the variable *content* of a FACT, whereas the FACT-schema itself represents the more or less constant cognitive representation of the *structure* of segments of reality. This distinction is well-known at other levels of representation also (e.g., in syntax), where we have the categorical structure of the sentence on the one hand and the actual words and phrases on the other hand. The FACT-structure, hence, is the "syntactic" framework of the semantic representation language.

Although it would be possible in principle to represent FACT-like structures in a complex proposition (e.g., with argument labels), we prefer the intuitively more satisfactory schematic representation. Note that the propositional representation is not formally more adequate because of the lack of a formal semantics for functional relations and other properties of FACTS.

Besides the further cognitive aspects of FACTS and their role in discourse and action processing, which we discuss later, a more philosophical remark is necessary here. FACTS are cognitive representations of the (real or other) world entities which we called facts and which we take to be the referents of clauses or (simple or complex) sentences.[16] Our usual conception of the

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[16]At this point our theory deviates from classical formal semantics, where the denotation of sentences are the truth values (true, false, and sometimes also indeterminate). In our opinion all expressions of a language, sentences as well, should denote certain properties of possible worlds (viz., individuals), and their properties and relations and also the 'units' formed by individuals having such properties or relations (viz., facts). We consider 'true' and 'false' to be properties of

intuitive notion of "fact" implies the existence of a fact, or truth, in the *real world*. This is however not the way we use the notion of fact: Other possible worlds are also made up of facts, and these facts may or may not be similar to the facts of our own type of possible worlds. The further philosophical problems involved here are not discussed in this book, but it should be recalled that this means that we should distinguish between the "concrete" facts of a given world which are spatiotemporally determined and the *factconcepts* which are merely conceptual abstractions and may or may not be *actualized* or *instantiated* in some world.[17] In our FACT-schema this would mean that a fact-concept would be represented with variables for individuals, world, place, time, etc., in the terminal slots of these categories. Depending on basic postulates, such as physical, biological, or other laws, rules, or principles, a fact-concept may thus be realizable in the actual world and worlds similar to these or else in other types of possible worlds (e.g., "the table was singing"). Instead of fact-concepts we also may speak of possible facts. Hence, an impossible fact is a fact that cannot be realized in any possible world ("the bachelor is married to an American girl").

Note that a fact, and also its cognitive representation as a FACT, is defined in terms of an event *plus* its possible world properties. Facts are not elements of a possible world but define possible worlds: It is an *event* that may take place at some point of time in a possible world but not a fact (we cannot say: "The fact occurred at five o'clock", but we may say: "He stated, doubted, etc., that fact"). Further philosophical complications of this theory of facts are not discussed here.[18]

1.3.5.   After this analysis of the possible representations for semantic or conceptual structures as they characterize discourse, cognition, and

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propositions or sentences. A sentence may be called *true* with respect to some world w_i and to some context of utterance c_i if it denotes a fact in w_i. For the use of this notion of fact in the analysis of discourse, see van Dijk (1977a). Linguistic, philosophical, and logical details of this aspect of semantic theory are not given here. See Prior (1971) for a different view.

[17]The use of notions such as 'fact-concept' and 'possible fact' follows that of 'individual-concept' and 'possible individual' in the formal theory of semantics outlined by Montague (1974). See also the recent discussion in Rescher (1976a) and further references given there. Concepts in this philosophical sense of the term are linked with the notion of intension briefly mentioned in footnote 9.

[18]The distinction at issue here is that discussed by Wittgenstein (1921) between Tatsachen (facts) and Sachverhalte (events; states of affairs). In semantics the same distinction has been made in Bartsch and Vennemann (1972). It should however be stressed that at present no really explicit theory of these notions, and their differences, is available. Some of the cognitive implications of the distinction are discussed in Chapter 6 and in a paper now in preparation. It should be repeated here that what we take as facts or events are certain real-world projections of cognitive constructs: The same physical reality may be interpreted as different facts. Philosophically, both propositions and facts are 'logical constructs,' the first of a language (meanings) and the second of the 'world(s)' denoted.

interaction, we go to a more detailed investigation into the properties of macrostructures in these various domains. In this chapter we have given a provisional intuitive analysis of the notion of "global structure" and a first approximation to the delimitation of the theoretical reconstruction of such global structures in terms of semantic macrostructures.

A number of more specific details involved in the semantic representation of discourse and action must wait until the respective chapters. The same holds for other aspects of meaning and knowledge representations that are necessary to account for discourse, and action and their macrostructures, such as *frames* or *scripts*, connection and *coherence* constraints, the format of *macrorules*, and the further analysis of *action* and *interaction*. Previously, actions were only analyzed in terms of a FACT-schema, but many more aspects are involved that require our attention, such as their "underlying", mental plans, goals, purposes, motivations, or decisions. Similarly, in this chapter, we have neglected to provide the more specific properties of *pragmatics* [accounting for the *speech act(s)* that, in a particular context, may be performed by using an utterance of a sentence or sentence sequence], although it is obvious that much of the semantics and the formation of FACTS depends on underlying pragmatic structures. We return to this more particular issue in Chapter 3. We note the omission from this chapter here to underline the importance of pragmatics, not only in the necessary relation between discourse and interaction but also in the processing and representation of discourse itself. Most models now existing for discourse understanding fully ignore a pragmatic component, which leads to inadequate or at most partial accounts of discourse and discourse processing.

2 Macrostructures in Discourse

2.1. INTRODUCTION

2.1.1.   In Chapter 1 we see that macrostructures appear in various ways in natural language *discourse*: We refer to them explicitly; we may use them consciously; we express them; and so on. In this chapter we provide a systematic analysis of macrostructures in discourse. Since we have assumed that macrostructures are *semantic*, this analysis is meant as a contribution to the semantics of global structures in natural languages. This means that we need to specify what the relationships are between macrostructures on the one hand and the semantic structures of sentences and sequences (i.e., microstructures) on the other hand. In this chapter, then, we start formulating the various rules relating macrostructures with microstructures. Although we give a brief summary of the 'microlevel' analysis of discourse (viz., of such phenomena as linear connection and coherence), we cannot provide a full text grammar or theory of discourse in this book. We must limit ourselves to the macrosemantics of such a grammar and only specify how microstructures determine, and are determined by, macrostructures.

The main thesis of this chapter, then, is that discourse cannot be adequately accounted for at the microlevel alone. Without a level of semantic macrostructures we are unable to account for various properties of 'global meanings' of a discourse. At the same time it is shown that macrostructural interpretation is also a necessary condition for the interpretation of sentences and the establishment of local coherence at the microlevel. Finally, it is claimed that a macrocomponent is a legitimate part of a linguistic semantics of discourse and not merely a component of a psychological model of discourse processing.

2.1.2.   To show the linguistic and grammatical relevance of an analysis of semantic macrostructures, we also analyze the various ways in which macrostructures may more or less directly appear in 'surface structures' of the respective sentences of the discourse. We see in Chapter 1 that we use words like *theme, topic, upshot*, or gist to denote semantic macrostructures of discourse. Similarly, macrostructures may be expressed in the discourse itself by *thematical* (or *topical*) *words or sentences*. Finally, we have several other means to express macrostructures (e.g., by way of *summaries*, short *paraphrases*, and *conclusions*). It will be shown that several grammatical phenomena cannot properly be described without postulating semantic macrostructures. However, these important surface-grammatical aspects of macrostructures are merely a 'reflection' of their crucial underlying role (viz., to establish global meanings and global coherence in a discourse). It is on these basic semantic properties that we focus our attention in this chapter, not on an exhaustive description of all the ways macrostructures can be explicitly expressed.

2.1.3.   We have stipulated that macrostructures are taken as *semantic* global structures in discourse. It has been made clear earlier, however, that discourse may also be assigned other kinds of global structures (e.g., *schematic superstructures*). In rather general terms we pay attention to superstructures in Chapter 3, primarily because macrostructures may depend on such superstructures. The observations made in this chapter, therefore, must remain rather general, and abstract provisionally from variations in superstructural schemata and the discourse types they characterize.

2.1.4.   The same holds for the links between *semantic* and *pragmatic* *macrostructures*. Discourse in natural language is not only a grammatical object but an utterance at the same time that may function as a social action (viz., as a speech act). Sequences of speech acts, expressed by subsequent utterances of sentences of a discourse, may also be organized at a global level, as *macrospeech acts*. In other words, a discourse may also exhibit global structures that should not be accounted for in semantic or in schematic terms but rather in terms of action, of interaction, and in particular of speech acts and the pragmatic context in which they are appropriate or not. Sequences of sentences and sequences of speech acts and hence semantic macrostructures and pragmatic macrostructures are intimately linked: A global speech act should after all also have a global 'content,' a theme or topic. As an attractive and necessary bridge toward the (inter-) actional study of macro structures, we analyze pragmatic macrostructures in Chapter 5 and hence neglect here the various pragmatic properties of discourse and the specific constraints on semantic macrostructures that come from the pragmatic context and the global speech act performed.

2.1.5.   In this chapter, our analysis has a more or less *linguistic* nature; that is, we abstract from the proper *cognitive* aspects of macrostructures and discourse, such as various kinds and phases of processing, memory limitations and store capacities, interpretation and retrieval strategies, and formation plans. As usual we do as if discourse 'has' a conventional meaning, instead of being 'assigned' such a meaning in actual processes of comprehension. Of course, this is a theoretical abstraction and not, as such, a theory of how macrostructures are actually understood, formed, or executed during comprehension and production. We discuss all these cognitive aspects of discourse processing in Chapter 6, because the cognitive principles involved are very similar, if not identical, with those operating for speech acts, interaction, and other cognitive functions such as perception, thinking, and problem solving.

There are linguists who maintain that semantic macrostructures, if such things 'exist' at all, are not an object of study for linguistics, let alone for grammar.[1] If language users do interpret 'globally,' they would hold, this should be accounted for in terms of cognitive operations. We have serious reasons not to share this limited conception of linguistics. Macrostructures, most certainly, have a cognitive basis but so have meanings-and grammar for that matter-in general, and also words and sentences. In *all* cases, for instance, *knowledge* of the world, strategies, processes, etc., are involved. Conversely, macrostructures in discourse should also be interpreted on the basis of semantic rules. In other words, there are no serious reasons not to study global meanings of discourse within linguistics or even within grammatical semantics. As we suggested before, many semantic aspects of sentences and sequences cannot even be properly accounted for without semantic macro structures. Finally, semantic macrostructures are also exhibited in surface structures-if that would be the decisive criterion for treating phenomena in linguistics and grammar. Hence, in this chapter we begin with the more abstract linguistic-semantic analysis of macrostructures and later return to the various cognitive implications of this analysis. However, this linguistic approach is not fully independent: We have tried to formulate semantic macrostructures and macrorules in such a way that they are relevant more or less directly for a model of cognitive processing of complex information. Such a model will only have to formulate a number of important additional principles and processes. In this way, this chapter could

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[1]See Dascal and Margalit (1974) and other reviews of van Dijk (1972) in Projektgruppe Textlinguistik (1974) for critical discussions about the notion of macrostructure in a grammar. See also Metzing (1977). Note that the earlier criticism was mainly directed against the first, very tentative and informal, formulations of the theory of macro structures. The more explicit macrorules as they are formulated in this chapter were developed only around 1974, mainly in the framework of a cognitive processing model (see van Dijk, 1978e).

also function as the first, theoretical, section of a much longer chapter on cognitive comprehension of discourse.

Although such an approach may have certain drawbacks, we think it is the most fruitful one for *interdisciplinary* research: Try to formulate adequate models or theories for the respective aspects of a phenomenon or problem, but in such a way that the general setup, notions, and principles in the respective domains are similar or can be easily connected.

2.2. MICROSTRUCTURES OF DISCOURSE

2.2.1.   Under *microstructures* of discourse we understand in this section all those structures that are processed, or described, at the local or short-range level (viz., words, phrases, clauses, sentences, and connections between sentences). In other words, microstructures are the actually and directly 'expressed' structures of the discourse. We use the term, however, mainly as a practical collective term and not as a theoretical term, although such a term may have at least certain cognitive validity. The theoretical terms we use are sentence and sequence of sentences. The first term is well-known from classical grammars and the second term has been introduced mainly in so-called *text grammars*[2]. Text grammars are grammars (of any kind) which are not limited to a description of isolated sentences but which also account for structures beyond the sentence level or structures characterizing discourses and conversations as a whole. By a text we understand the abstract underlying structure of a discourse. Hence, *discourse* is an observational notion, whereas text is a theoretical notion. In principle, discourses should normally exhibit sentential and textual structures to be *acceptable* in a language community, but this does not mean that they actually always do have these structures. As soon as we talk about language use and cognitive processing, we therefore use the term 'discourse' and not the term 'text,' which is only used in the abstract grammatical reconstruction of natural language discourses. A similar distinction would in fact be in place for the notion of sentence, which is also used ambiguously either as a theoretical term or as an observational term. In this chapter we use the term 'sentence' only as a theoretical term, unless

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[2]Literature on text grammar is abundant, and we therefore only mention some books and readers where further references can be found: van Dijk (1972, 1977a), van Dijk and Petöfi (1977), Petöfi and Rieser (1973), Grimes (1975), Werlich (1976), and Dressler (1977, 1978). There are book series on text grammar and discourse theory published by Buske (Papers on Text Linguistics, Hamburg), de Gruyter (*Research on Text Theory*, Berlin), and Ablex (*Discourse Processes; Advances in Research and Theory*, Norwood, N. J.), and two interdisciplinary journals, *Discourse Processes* (Ablex, 1978) and Text (Mouton, 1980). An early bibliography on text linguistics (Dressler & Sehmidt, 1973) lists several hundred titles. For an introduction to text grammar, see Halliday and Hasan (1976) and Dressler and de Beaugrande (1980).

otherwise indicated. The same holds for the notion of a *sequence*, which is an *ordered n-tuple of sentences*. One of the more specific tasks of a text grammar is to specify what the rules are determining which sequential orderings of sentences are grammatical and which are not. In other words, a text grammar must indicate what the nature of the specific ordering relations is. This analysis takes place both at the local and the global level, as we have seen before. In this section we are briefly concerned with the textual description at the level of microstructures (viz., that of sentences and sequences of sentences).

2.2.2.   Since we are concerned here with discourse and not with individual *sentence structures*, we shall be very brief about these[3]. Above all sentences are expressions of certain *syntactic structures*; that is, although there are certain semantic differences between composite sentences and sequences of sentences, it is hard to find straightforward semantic definitions of sentences, although it has been suggested at the end of Chapter 1 that sentences may well correspond to the cognitive notion of a FACT. Besides these semantic underlying structures of syntactic and morphonological surface structures of sentences, there are also pragmatic constraints on sentences and sentence boundaries.

Syntactic structures are analyzed *categorially*; that is, words and phrases combine to more complex structures according to the various syntactic categories to which they belong (Noun, Noun Phrase, etc.). This categorial analysis is *hierarchical*: Superordinate categories may be further analyzed into subordinate categories. Finally, these hierarchical syntactic structures are linked with the actual sequential (word-) *order* of the sentence, which is expressed by morphophonological structures.

Since discourse relations and especially those we need in order to derive macrostructures are primarily *semantic*, we further abstract from syntactic and morphophonological, or 'surface' structures, of sentences and focus attention on their semantic or 'underlying' structures.

Sentential semantics has much in common with the semantics of textual sequences of sentences.[4] Essentially, categorially analyzed sentences are semantically *interpreted; that is, the respective expressions* (words, phrases,

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[3]We do not give separate references to work about the respective grammatical notions used in the following sections. The reader is requested to consult current linguistic introductions for explanations, examples, and further reference. In these sections no examples, and analyses are given of sentential structures, first because they are outside the scope of this chapter and second because the introductory sections of this chapter would become too long.

[4]The most complete current survey of (linguistic) semantics is Lyons (1977). The reader is referred to these volumes for further discussion and explication of the terms used in this section. Our semantic approach has been inspired by logical (formal) semantics (see footnote 7 of Chapter l, p. 16, for references).

etc.) *and their* (categorial) *structures* are assigned meanings. The interpretation rules must be such that: (1) the sentence meaning is a function of the meaning of its parts: and (2) the structure of the sentence meaning is a function of the syntactic structures. Meanings-in a linguistic grammar-as specified in the *lexicon* of the language, are associated with each word, and sometimes (fixed) phrases, of the language. The semantic interpretation rules compute on the basis of these word meanings and the semantic structures whether the meaning of the whole sentence is 'well-formed' or the sentence is *meaningful.*

This kind of meaning interpretation, which has been the usual kind in linguistics, is called *intensional,* because expressions are assigned *intensions* by the interpretation rules. Under the influence of logic and philosophy, however, such intensionally interpreted sentences may also be assigned an *extensional* interpretation. In that case, expressions (with a certain meaning) are related to certain aspects of reality (viz., the *referents or denotata* of those expressions). Different categorial expressions are thus interpreted as different semantic (referential) types (e.g., noun phrases or terms as individuals and verbs as properties or relations of individuals). It has been stressed that such referential assignments, unlike in classical logical semantics, go 'via' their intensions or meanings. In fact, such intensions or meanings may even roughly be described as specifications of the 'range' of concepts that may be actualized by the various types of referents. Hence, meanings or intensions are conceptual abstractions, conventionally associated with expressions of a natural language, either in the lexicon (which is part of the knowledge of the world of language users) or by semantic rules. In more formal terms we say that intensions are *functions* that for certain values of other arguments (e.g., the possible world in question; see the following) are assigned extensions. Thus, the intension 'table' is a conceptual function that may have all actual tables, in the actual possible world or in other possible worlds-or situations, as its extensional values. Note, by the way, that even these actual individual tables are not, strictly speaking, spatiotemporally and physically 'unique': The 'same' table may change, and a *fortiori* the 'same' person may change. So, theoretically, even the 'same' objects we refer to, think of, and represent cognitively are again constant *functions*, that is, concepts that have varying physical, physiological, or biological properties as values. In cognitive theory this 'conceptual' nature, also of individuals, is a much more natural conception than is the case in logic, philosophy, or linguistics.

2.2.3.   As soon as we want to analyze the semantic structures of sequences of sentences, we no longer have to do with the interpretation of and relations between individual words and phrases, but we need intensional and extensional units that combine these interpretations at the level of whole clauses and sentences. Thus, we say that the intensional unit, that is, the

meaning, of a clause or sentence is the *proposition*, and the extensional unit is the *fact*. We have seen before that a proposition may be taken as a *possible fact*, which has actual facts as values in different possible worlds. A fact is an event, action, state, or process in some possible world. Hence a possible world is a set of facts. Conversely, a proposition or possible fact is a set of possible worlds, viz., the set of those worlds where the proposition has values ('is true'). A proposition may be said to be *true* (or more generally *satisfied*) with respect to a world if it denotes a fact of that world. Truth, however, is usually a notion that, outside modern philosophical logic, attaches to facts in our 'own,' real world. Moreover, it is often used not of propositions but of sentences or even of uttered or asserted sentences. In our discourse semantics, therefore, we provisionally avoid the notion, and we use the more general concepts of *satisfaction* and *reference*. This allows us also to speak of the denotation of imperatives, interrogatives, and indicative sentences that are not used as assertions but as promises or threats.

Both complex sentences and sequences of sentences express *sequences of propositions*. The sequence of propositions expressed by the whole sentence sequence of a text is called the text bases As specified earlier, a textual semantics should specify which *text base*.[5] are meaningful and satisfiable and which are not; that is, conditions must be formulated that spell out what properties propositions must have in order to be able to follow each meaningfully or how propositions can be mutually *connected*. In general, it is the task of textual semantics to define the notion of *coherence*.[6] Whereas later in this chapter macrostructures are specified that define the global coherence of the text base, we now should look at the local coherence of the text base (viz., the various relations between *propositions* and the *facts* they denote). Since the phenomena and problems involved in the semantic study of sentences and sentence connections are extremely complex, it is possible only to give some hints about the major characteristics involved.

2.2.4. The simplest way to tell whether a sentence is meaningful is to consider whether the proposition it expresses denotes an *imaginable fact*. For certain purposes, our imagination may be limited to the kind of facts we find in our own physicobiological worlds. In that case, sentences like *The flower had a headache* or *My sister dissolved in water* are not meaningful, at least when taken literally. However, it is well-known that our imagination also constructs other kinds of possible worlds, where physical and biological laws

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[5]The term 'text base' was first used by Petofi (1971) and is also used now in cognitive models of discourse (Kintsch, 1974; Kintsch & van Dijk, 1978).

[6]The discourse semantics, and its various concepts, such as 'connection' and 'coherence,' are discussed in more detail in van Dijk (1977a).

are (more or less) different from those in the set of worlds of which our actual world is a member. This means that meaningfulness of sentences is worlddependent: If we can imagine at least one situation in which a sentence may denote a fact, the sentence is meaningful. A semantic interpretation for a language specifies the *conditions* that must be satisfied for such a situation and fact to obtain; these are the *satisfaction* (or in particular the truth-) *conditions* of a sentence in order to be meaningful.

The same approach can be taken in order to specify the meaningfulness of *texts*, taken as sequences of sentences. If such a sequence denotes a sequence (ordered set) of facts that in some world and situation can be imagined, the text is meaningful. Since facts manifest themselves as states, events, actions, or processes, this means that a textual sequence of propositions (or the sentences expressing them) must denote a possible or actual sequence of events, actions, processes, and/ or states of affairs. Such a sequence in usually called a *course*, when we speak of events or actions. In other words, if we want our semantics to spell out for texts when they are meaningful, for a particular set of possible worlds, we must specify the conditions under which courses of events or states of affairs may obtain in these worlds.

For courses of events and actions we therefore must be able to tell which kinds of events or actions can follow each other and in which order. The basic relationship involved in this case is that of *condition*. We say that an event or action conditions another action or event. This conditional relationship may be of different kinds, which we call the strengths of the conditional. The weakest conditional is that of *compatibility* or *compossibility*: one event makes another event possible or *allows* another fact to occur. The relation of *probability* is stronger: An event makes another event likely to occur. Strongest are various kinds of *necessity*: An event makes another event physically, biologically, psychologically, etc., necessary. In terms of the semantics of courses of events, this means that *at least one, most*, or *all* possible courses of events leading from the one event lead to the other event. Thus swimming may lead, at least in one possible course of events to drowning; going to bed most likely leads to falling asleep; and being shot through the head necessarily (nearly) leads to death, at least in our possible worlds. Later we see how this account should be specified for courses of action, which are a specific ease of courses of events.

Since texts *represent* courses of events, their meaningfulness, as we said, depends on the correct conditional relationships holding in such courses of events. Texts that are meaningful in this sense are called *coherent*. Later we treat additional conditions of coherence: At the moment it is sufficient that .he sentences of a textual sequence denote the respective events of a possible course of events as it is conditionally *connected*. We say that two sentences or propositions are *connected* if the facts they denote are conditionally related:

(1) John fell from the stairs. He broke his arm.
(2) John has broken his arm because he fell from the stairs.
(3) A tree fell on our house. The roof was destroyed.
(4) The roof of our house has been destroyed because a tree fell on it.

We see that the relations between events may be represented either by a sequence of sentences or by a composite sentence: Both express sequences of propositions. We also observe that the fact relation may be expressed by a connective (e.g., *because*), as in (2) and (4), or it may not be expressed explicitly, except for simple linear coordination of the sentences. Note also that clause or sentence ordering does not always correspond to fact ordering: The subordinate postponed clauses in (2) and (4) denote earlier facts. Similarly, if we change the order of (1) and (3), we also denote two, conditionally related, facts, but the 'inverse' ordering at the same time indicates a certain *function* (viz., that of an *explanation*). Thus, explanatory sentences may, without a connective, be expressed by postposition. These functional relations between sentences are partly *pragmatic* and are discussed later. Semantically, the *normal ordering* of sentences follows the conditional and hence temporal ordering of facts, unless indicated otherwise by connectives.

What has been specified for events may also be applied to the relations between *states* and *events*. In the strict physical sense we might maintain that only events can condition (cause, etc.) events, but both linguistically and cognitively we also take states as possible conditions for events:

(5) John was ill. He called a doctor.
(6) It was very hot. The flowers faded.

Of course, John's being ill is a *reason* for calling a doctor, which involves several mental events, such as decisions. Similarly, it is the difference in temperature that prevents the normal biological processes in the flower. But, both in cognition and in language, we may thus abstract from such 'component events' and merely denote the crucial *state* or *situation* as the condition for a certain event. The same holds in those cases where states seem to be conditioned by events, although strictly speaking states may only be results or *consequences* of events.

The conditional relation operates both 'backward' and 'forward.' On the one hand we may say that an event *causes* another event; on the other hand we say that an event is a *consequence* of or is caused by another event. Thus, we may have possible, probable, and necessary consequence relations, with the same for conditional relations. Having enough water is a necessary condition for flowers to grow, whereas going to bed is a possible or probable (but not necessary) condition of falling asleep, which itself is a probable consequence

of the event of going to bed. We obtain nine kinds of possible relations, between facts, depending on the strength of the connection either way. Texts not only represent courses of events, they also may be about states, as we have seen. Very often this kind of *state description* is part of an event description: The state description is *relevant* only as a specification of the initial, intermediary, or final state (result) of an event or action, as in (5) and (6). This also is the case in texts that are primarily about actions, such as stories: We need a description of the individuals, situation, etc., to know what kind of events or actions are possible. This means that we also need meaningfulness conditions for state descriptions, because, as such, these cannot be framed in terms of causal or other conditions. Again, the coherence of such descriptions depends on (our cognition of) the represented facts: We shall try to map a certain fact ordering in our ordering and selection of sentences. Roughly speaking, coherence of state descriptions first of all requires identity of *possible world* and *situation*, as is, in principle, the case for event descriptions. Second, the description should be about facts in which the same or related objects participate, a condition that we treat separately later. Finally, the descriptive facts reported must also as a whole be related according to a number of ordering criteria, such as *general-particular*, *whole-part*, and *container-content*:

> (7) In the room was a big table. On the table was a big vase. In the vase were red roses....

The precise rules for state descriptions are still obscure, but although there may be some freedom in the ordering-which may even be stylistically varied-it is obvious that state descriptions may not be arbitrary:

> (8) In the corner there was some beer. It was in a glass, under which stood a brown table....

We see that in the same way as we represent events according to our perception and (intuitive) interpretation of conditional relations between facts, in general state descriptions are correlated to fundamental processes of perception and comprehension of *scenes*. Second, from a *pragmatic* point of view, we should recall that a speaker will try to give a description that will lead to an adequate scene representation in the hearer. In general this involves the more important or global facts, such as background, situation, or main individuals, coming first and more specific properties later. Only specific relations of relevance assignment or *focus* may change the ordering, as well as the functional relations (explanation, ntroduction, correction, etc.) briefly mentioned previously.

Provisionally we may conclude that the meaningfulness of texts is based on relations of conditional connection between facts that constitute courses of events or scenes but that the actual ordering of the sentences or clauses, as well as other (functional) relations between propositions, may depend on pragmatic and cognitive constraints of language use.

2.2.5.   State and event descriptions involve *individuals* (e.g., objects or persons). Similarly, they involve *properties* of these individuals and *relations* between them. A text is usually about successively *changing* properties and relations of a *limited number* of individuals, the so-called *discourse referents.* Since courses of events or courses of action, being the denotata of texts, must be connected, it follows that there also are relations between individuals in the respective facts. A well-known relationship is that of *identity,* as it is normally expressed by pronouns or noun phrases with definite articles. It was this study of coreferential expressions across clause and sentence boundaries that has given rise to the first linguistic analyses of discourse. We now see that referential identity is merely one aspect of textual coherence; it is neither necessary nor sufficient, as long as the facts denoted are connected:

  (9)   It was a beautiful day. We went to the lake to swim.
  (10)   We went to the lake for a swim. Yesterday we had our class of linguistics at 5 p.m.

Yet, in many cases connected facts involve related individuals, so that discourse coherence is also usually based on intrafactual properties. Besides identity, we may thus have other relations between individuals, such as possession, spatiotemporal relations, and part—whole relations.

Predicates may also sometimes be related (e.g., when identical properties or relations are predicted of different individuals). The same holds when relations are established between general properties/ relations and more specific cases of them, as between 'travelling' and 'taking a train.' Yet, it should be noticed that it is not the isolated predicate as such that is related in that case but the whole proposition, including the individuals: My travelling is independent of other's taking the train, for instance.

Finally, a sequence of propositions, denoting a sequence of facts, must respect various coherence conditions of *modality:* Places, times, possible worlds, etc., may be required to be identical or connected, and the same may hold for the sentential 'moods' (to believe, to want, etc.) that require sentences under the same modal 'scope' to be connected; otherwise a *change* of scene, world, situation, etc., is required. Such changes are not arbitrary: We may only come to a dream world 'via' the fact that somebody is dreaming in the real world.

2.2.6.   Although text bases in principle denote scenes or courses of events, this does not mean that there is a one—one relation between the actual facts

and the propositions expressed by the text representing them. Typically, textual propositional sequences are *incomplete.* This completeness degree depends on cognitive, pragmatic, and social factors. First of all, in order to make assertions for instance, we need not express those propositions that we believe the speaker to know already. Second, it is seldom *relevant* to mention all the facts characterizing a certain scene or course of events: We only represent those that we assume the hearer might be interested in knowing. Hence, a text has varying degrees of (in-)completeness, depending on cognitive and pragmatic constraints.

One of the important cognitive factors involved is *knowledge.*[7] Thus, it may well be that subsequent clauses or sentences denote facts that as such are not related conditionally in the ways described previously. This is mainly because the scene or course of events denoted exhibits a number of properties that, independent of the actual discourse, are known to the hearer due to his general *knowledge of the world* or his more particular *knowledge of the communicative situation* (speaker and his properties, etc.). Apart from the conventional knowledge as it is represented in the lexicon of a language, a strict linguistic semantics cannot possibly specify these 'missing links' of a text base in order to produce coherent interpretations. This means that at least part of the semantics for discourse should be handled in a *cognitive model* that specifies the kinds of knowledge involved in establishing connection and coherence. Although this may be true, we do not make this strict distinction between grammar and a cognitive model. To be sure, the actual comprehension and application of knowledge in the respective *processes* of comprehension and memory are left to the cognitive model, but *in abstracto* the (linguistic) semantics may well specify what kind of abstract knowledge must be involved in order to establish coherence. This means that the traditional lexicon format should be extended with an abstract world knowledge theory.[8] Since knowledge may also be represented in terms of *propositions,* there is no formal difficulty doing so. Instead of merely interpreting sentences and sequences of a language with respect to so-called semantic *models,*[9] containing a set of possible worlds, sets of individuals, etc., we should also take into account a *knowledge set,* including the knowledge of the speakers/hearers. The interpretation rules would then specify that if two

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[7] Although the role of world knowledge in the interpretation of texts has always been recognized, it should be recalled here that its crucial importance as well as models for the representation and use of world knowledge have been shown primarily in artificial intelligence work on discourse (Charniak, 1972; Schank & Abelson, 1977), to which we turn in Chapter 6.

[8] In text grammar this has especially been the aim of the recent work of Petöfi (1976; Petöfi & Bredemeier, 1978).

[9] The notion of 'model' used here is that of formal semantics (also called 'model theory'). Such a model is an *n*-tuple of elements that constitute the interpretation basis of expressions (e.g., possible worlds and their internal make up) and some interpretation function. For an introduction to this notion of semantic models, see Hughes and Cresswell (1968).

propositions *p* and *q* cannot be connected directly, a third (or more) proposition *r* may be taken from the knowledge set in order to connect *p* and *q* *indirectly:*

(11) I went to the station in a hurry. But, the train had already departed.

The interpretation in this case would need at least one knowledge item specifying that in general there are trains in stations and that these depart at certain fixed times.

The grammatical relevance of such a knowledge set already appears from the use of a definite article in the noun phrase *the train* in the second clause. The surface coherence marker seems to indicate that one or more propositions remain *implicit* in the text base itself. Note also that this kind of world knowledge is required not only for the establishment of textual coherence but for the interpretation of sentences or clauses as well: To know that the second sentence of (11) is meaningful, we must know that trains are objects that have the property of departing at certain times (from stations). *How* a language user builds up, uses, or changes this knowledge is a problem for cognitive psychology and artificial intelligence, to which we return in Chapter 6.

The knowledge that plays such a crucial role in discourse comprehension and the establishment of coherence in textual semantics pertains not only to individuals or their properties or relations. We may have similar conventional knowledge of whole scenes, episodes, courses, or events. Such knowledge has often been described in terms of *schemata, scripts, frames,* or *scenarios.*[10] Important for linear text interpretation is that propositions from these knowledge frames may be actualized in the establishment of coherence, and at the same time the sequence of textual propositions as a whole becomes *organized* because it denotes a well-known episode or course of events. It is at this point where the microstructural organization of texts is linked to the macrostructural organization.

2.2.7.   The brief survey we have given in this section of the major semantic properties of text structure at the local level could only touch upon the basic principles. In fact, the 'real' linguistic work starts where we have left off: Specify which syntactic structures are conventionally interpreted as which semantic structures; formulate the detailed conditions under which propositions may be combined and expressed by either composite sentences

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[10] These notions, which are due to the work in artificial intelligence mentioned before, are discussed further in Chapter 6.

or sequences; enumerate the morphonological and syntactic means for expressing the various kinds of coherence relations discussed previously; etc. We have mentioned only a few *connectives,* such as *because* and *so,* but fact connections may be represented by many other connectives, of which the precise semantic and pragmatic interpretation need to be worked out. Furthermore we have left unspecified which *functional relations* exist between sentences or clauses besides the referential ones treated previously: One sentence may be (used as) a specification or generalization of another, may provide an explanation, may serve as an introduction, etc., relations that we meet again when we talk about relations between speech acts in Chapter 4.[11] It has appeared previously that texts may be more or less *(in-) complete,* but we have ignored the various conditions determining the relative completeness of certain passages of a text: As soon as certain facts or episodes become important or relevant, we go to a more precise *level* of description and hence of completeness. Certain properties of this level-specific description are treated in Section 2.8. Next, semantic information may be variously *distributed* over clauses and sentences of a text: We distinguish between the *topic* and *comment* of a sentence according to textual conditions of earlier introduction or cognitive conditions of prior knowledge of the speech participants, together defining what the relevant concept is that a sentence or sequence is 'about.' Some aspects of this notion of 'aboutness' are made explicit in terms of macrostructures. The same holds for all kinds of *presuppositional* phenomena in texts. Presuppositions also involve prior introduction and knowledge, though not of terms but of full propositions, with which 'new' propositions are being linked. Sentence structure, relative clauses, uses of words like *also* and *even,* or certain particles depend on these presuppositional structures of text bases. Similarly, besides various distribution phenomena of texts, we may have different ways of *presenting* semantic information according to the *perspective* or *point of view* of the speaker: He may describe facts from his actual point of view or from that of (other) participants at the time of occurrence of the facts, or he may mix these points of view or leave them unspecified (opaque).

Finally, an appropriate linguistic semantics would need the formulation of explicit *interpretation rules* and a *model theory* specifying what kind of abstract world structures (types of individuals, properties, etc.) are involved in interpretations. All this has been ignored in this section in order to be able to focus attention on macrostructures.

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[11] See Grimes (1975) for a first intuitive approach of these functional relations between sentences in discourse.

2.3. THEMES, TOPICS AND
GLOBAL MEANINGS OF DISCOURSE

2.3.1.   It is the main thesis of this chapter that the meaning of texts cannot be adequately described at the local level of sentences and sentence connections alone but that textual meaning should also be specified at more global levels. Such a thesis would be trivial if, for instance, the meaning of a text as a whole, or of larger fragments of it, would be a straightforward result of computing the meanings of its individual sentences. Such a trivial solution of text meaning at the global level would be any model that simply establishes a text base according to the connection conditions mentioned above. A text would then be coherent if and only if the text base would be appropriately connected by conditional relations among facts and the interpolated propositions from world knowledge. However, although this is a necessary condition of global textual coherence, it is most certainly not a sufficient one.

   We can easily illustrate this point by taking a 'text' which exhibits the usual conditional relations, and even other relations of local coherence, such as participant identity, but which is not an acceptable discourse from an intuitive point of view when it would be uttered:

   (12) John was ill, so he called the doctor. But the doctor could not come, because his wife wanted to go to the theater with him. They were playing Othello, which she thought they could not miss because Shakespeare is one of the few dramatical authors who.....

We see that each fact may be a condition (cause or reason) for a next fact; participants may be kept identical for a while; etc.; but somehow, *as a whole,* this fragment has no coherence: It jumps from one *topic* to another without any *orientation* except for linear, pairwise connections between the facts. If somebody would tell us such a story, we would remind him of his initial topic, John's illness, and ask what Shakespeare has to do with it. We would ask, in a conversation, what the *point* of the story is. In other words, (12) as a whole is missing a very important level of semantic *organization* (viz., one globally valid *theme* or *topic).*[12]After the second sentence a hearer or reader will expect the story to continue with assertions about John, his illness, and the actions of the doctor; that is, we expect that the discourse be organized

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[12] The notion of 'theme' in discourse has also been studied in more detail by Kay Jones (1977). Note that the notion of 'topic' here should not be confused with that of '(sentence) topic' (see Section 2.2.7., which is a functional category in the semantic description of sentences [viz., a category to which semantic elements of a sentence are assigned that— roughly speaking—have been introduced in the text or context before (which are known to the hearer)]. See van Dijk (1977g) for a discussion of the difference between the two notions of topic.

around a semantic 'core' that we intuitively call a theme or topic. In this case, this theme or topic would be 'John's being ill.' Such a topic, which we call a *topic of discourse* (or, in particular, when it organizes a dialogue, a *topic of conversation),* must be a property of the global meaning or global reference of the fragment and hence be made explicit in terms of *semantic* structures. It is argued in the following that the structures involved here are *semantic macrostructures.* Intuitively we see that a topic is required for a text or a passage of a text to keep the text *globally coherent.* It is a general constraint that monitors the production or the comprehension of the discourse, as we see when we consider the cognitive aspects of discourse processing. In semantics it means that a further *level* of semantic description is necessary to assign global semantic structures that at the same time are constraints on the interpretation of the respective sentences of the text and on the establishment of additional coherence.

2.3.2.   The problem now is: In terms of semantic (macro-) structures how do we describe the kinds of meaning properties of texts that we have intuitively called the topic or theme of the text? What does it mean that during a fragment of the text a topic remains *identical* although the propositions of the text 'carrying' such a topic are subsequently different? What does it mean that a sequence of sentences is also coherent at a global level if not by semantic relationships between those sentences? And if several levels of semantic description are involved, how do we relate these levels?

To make the notion of topic of discourse explicit we proceed step by step, beginning with very simple texts and later carrying on the investigation for longer, more complex, and different types of discourse.

We have seen that the notion of topic for a passage of a text seems to involve a kind of *semantic invariance:* We speak of *the* topic of the passage or possibly, as we discover later, of several *alternative topics* for such a passage. This means that the topic holds for each sentence and for each sentence connection of the passage. At the same time we have observed that the topical semantic invariance has to do with semantic properties that subsequent sentences (or propositions) of a textual sequence must have *in common.* Let us take the first two sentences of the previous text fragment:

(13)   John was ill. He called the doctor.

In Section 2.2 we have seen that this sequence is linearly coherent because the facts denoted are conditionally related: The fact denoted by the first sentence is a normal condition (a reason) for the fact (the action) denoted by the second sentence. But now, what do these two sentences have further in common that would involve semantic invariance or identity? The only apparent identity showing in surface structure is referential: *John* and *he* refer to the same

individual being a participant (viz., the Experiencer and the Agent, respectively, in the two facts). In a sense, indeed, we may say that sequence (13), *as a whole, is about* John. In fact, grammatically *John* and *he* are at the same time the subjects of the respective sentences and also express the *sentence topics* of the respective sentences: They are expressing that part of the semantic structures of the sentence that is taken as the conceptual unit which is *introduced* or *reinstated* in order to make a statement where *new information* is involved.

Yet, although we say that 'John' is the topic of the two sentences or even that 'John' is the topic of the sequence, we would be reluctant to identify 'John' as the topic of the discourse as a whole. Although it is certainly true that 'John' is a common concept of the two sentences and that John is a common referent for them so that both intensionally and extensionally we are allowed to say, intuitively, that the sentences are *about* 'John' or the individual John, neither the concept nor the individual could constitute the full theme of the text. Text (13) is not simply used as an arbitrary story about John, with the only purpose to illustrate what kind of person John is like. So, although the concept 'John' would at least be an interesting candidate for the topic of this text, it is not sufficient as such.

In the discussion of (12) we have intuitively stated that the beginning of that text was about John's 'illness.' For the first sentence of both (12) and (13) this is perfectly clear: It is the state of affairs explicitly referred to. For the second sentence, however, this is not obvious, because this sentence refers to another person, the doctor, and to some action of John (calling). Yet, our knowledge of the world tells us that the state described by the first sentence still exists during the accomplishment of the action described by the second. What is more, John's illness is not merely a background fact for the second fact, but calling a doctor is a *normal component* or *consequence* of being ill. So, the first sentence describes a more or less general situation or condition of which the second sentence specifies a normal component. But in that case the proposition 'John is ill' must still hold. Indeed, intuitively, we would answer the question about the topic for this text with something like 'John is ill' or 'John's illness.' In other words, we have provisionally established for this example that there may be a proposition that 'holds' for both sentences of the text and in this case that this proposition may also be expressed in the text itself. The first sentence, so to speak, is a *topical* or *thematical sentence.*

We may continue text (13) by specifying that the doctor examined him, arrived at a particular diagnosis, and prescribed some medicine, which John took so that he became better (or not). In that case the whole text would still be about 'John's illness.' Hence, textual sequences of sentences may have a propositional *common denominator* that describes a situation or course of events *as a whole,* such that the constituent sentences denote *normal component actions* of this overall episode. We also now may conclude that

'John' is not the full topic of the sequence but at least part of the topic (viz., the Experiencer or the Agent of the *global fact* described by the respective sentences and represented by a 'global' proposition). Such a global proposition is called a *macroproposition.* Before we try to generalize our observations toward the formulation of the principles that allow us to *derive* a macroproposition from a sequence of propositions of a text, let us examine some further examples.

Take a very similar situation to that described in (13):

(14)   It was very late. But Mrs. Johnson had phoned that her husband was ill. So the doctor had to go to see him before he could go to bed.

The general situation is the same but now it is described from *the point of view* of the doctor: *The doctor* is subject in the second sentence and expresses also the sentential topics of the clauses of that sentence. Intuitively, then, we would say now that the passage is about the (or a) doctor, even if the initial sentence, contrary to the previous example, does not have 'doctor' as subject, Agent of a fact, or sentence topic. The intuitive topic of this text fragment however is not merely 'doctor' but rather 'The doctor had to make a late visit.' From this text alone, we would not conclude that the 'illness of Mr. Johnson' would be the topic unless this illness would be a prominent fact, possibly having dramatic consequences. As long as the visit is routine, it is the late visit that is most relevant, at least if the text is taken to be described from the doctor's point of view. We have the same phenomena as in the earlier example however: The late visit is described as such, but this time the first facts denoted by the text are *normal conditions* for such a late visit. The doctor could in fact later describe the same events by saying: *"I had to make a late visit that night."* He thereby would describe the episode as a whole and at the same time *summarize* a text like (14). We see later that topical propositions may indeed be expressed as summaries, such that summaries are a good empirical test for the global coherence of a text. In the present example we again observe that the respective sentences of the text denote the successive facts of an episode of which a macroproposition is the global representation. This is possible because the respective facts are *conventionally* or *stereotypically* associated as conditional components of the global episode.

Let us now take a simple example where the situation is less clear-cut:

(15)   John was ill. He didn't go to the meeting.

Again, we would expect 'John' to be a conceptual part of some macroproposition representing a global episode of which these two sentences denote the component facts. However, it is not obvious from this short text whether the topic would be 'John's illness' or 'John's absence from the

meeting.' Intuitively, we would take the first proposition as topic if the text would continue to talk about John and his illness and the second if the text would continue to represent events from the meeting. Since *the meeting* is definite in the second sentence and hence the sentence topic, we must assume that 'a meeting' was already introduced into the conversation. After that, it is asserted that John didn't go to that meeting because of his illness. Under such a description 'John's absence from the meeting' would be the topic, and the first sentence would describe a *condition* of this absence. In this case, however, this condition need not be stereotypical: John might have broken his arm for the first time in his life. This fact would not be *relevant* for the description of his absence during the meeting, as long as the major *focus* of the text is upon the meeting. In other words, it may be the case that, globally speaking, certain facts are less relevant than other facts in an episode described from a certain point of view or that only certain conditions or consequences of facts are relevant for other facts: Only the consequences of facts are relevant for the description of the meeting episode. In that case we may simply describe the same global state of affairs by saying *"John couldn't come to the meeting,"* thereby leaving out the reason or cause of that action, because this is irrelevant at a more global level of description.

From these few examples we 'may provisionally conclude that a topic, represented by a macroproposition, denotes a state or course of events as a whole, such that normal component facts or irrelevant conditions (or components or consequences) need not be represented at this more global level. In the first case the facts are conventionally or stereotypically associated, via our world knowledge with the global episode; in the second case they are *irrelevant details.* We try to define this notion of relevance in the following. The irrelevance of John's illness for the global description of the meeting only holds, as we said, at the global level. Locally, John's illness is a condition for his absence and hence indirectly specifies a property of the meeting (viz., the fact that John was not there). Irrelevance may however be still more obvious, as in those cases where some detail is not even relevant in the local sequence:

(16) The meeting went on forever. Outside it was snowing.
(17) The meeting went on forever. The bald head of the chairman shone in the lamps above the table.
(18) A boy came by on a bicycle. His trousers were wet because of the rain. She could ask him how to find the nearest police station.

In these examples we observe various kinds of detail. In (16) the topic of the first sentence is 'the meeting,' which apparently is also part of the theme of the sequence, because of the definite article and because of the presupposition that the meeting was held (and taking a long time). Reference to the snow

outside in that case is not thematically related to the meeting at all, neither as a component nor as a normal condition or consequence (if the meeting is not *about* continuous snowfall emergencies). Rather we here have a kind of descriptive or illustrative detail, implicitly mentioning the thoughts or observations of some participant of the meeting (not mentioned in this fragment). This detail, hence, may at most be a characterization of the *background* of the global event going on (viz., a description of the weather). In any description of 'what happened' when we later would describe the meeting, reference to the snow outside would be irrelevant. The same holds for (17), although in that case the detail is about some characteristic of an important participant of the meeting, the chairman. Yet, this description of the detail seems to suggest that it does in no way influence the meeting; it is not a normal component, nor a condition, nor a consequence. Again it is a descriptive detail that exhibits a vague idea of 'truthfulness' of the story fragment because of the nature of the observation. Such a detail would not appear in a business-like report of the meeting but rather in a short story or novel (e.g., in order to suggest something like 'atmosphere').

In (18) the second sentence also expresses a proposition that is irrelevant for the interpretation of the other sentences: Only the presence of a boy is relevant [viz., as a condition to accomplish some action (asking the way)]. Both the fact that he was on a bike and that his trousers were wet are descriptive details, which may be used to signal the observations of a participant, just as in (17).

In other words, texts, may express propositions which can be interpreted relative to other propositions but which are in no way a normal or necessary aspect of the events described but rather a *casual* observation (e.g., in order to enhance the degree of realistic description). Such events or states may be background detail, description of participants, or in general all those facts that could in principle be left out without changing the interpretation of surrounding sentences. Of course, in particular cases, such as detective stories or literary novels, such details may sometimes appear to be relevant later in the story. The specific functioning of such types of discourse, however, is based on the fact that in other kinds of descriptions or stories such details are *not* relevant. We see that the notion of local or global relevance is linked with the notion of *relative interpretation* and with that *of conditionality:* Irrelevant details are those details which do not determine the interpretation of other sentences and which denote facts which are no normal or plausible condition, component, or consequence of the other facts described or the global fact of the passage as a whole.

In the last few examples we no longer derive a macroproposition, that is, a topic, for a discourse fragment from *each* proposition but rather from propositions which are somehow denoting relevant, important, or constituent facts which are part of the global fact. The topic does not change

due to the details of the description nor does the interpretation of the sentences that 'carry' the topic. We no longer can speak in cases such as (16) about a common semantic denominator, whereas in the other cases only participant identity determines local coherence. On the other hand, at the other side of the spectrum of examples we have discourses where each proposition instantiates a global topic—and not a joint sequence of sentences as in our earlier examples, such as (13):

(19) John was playing with his top. Mary was building a sand castle, and Sue was blowing soap bubbles.

In this example the respective sentences do not denote events which are conditionally linked or which are components of each other. Nor does the sequence express a stereotypical text base. Yet, intuitively, we are able to construct a proposition that at a higher level of abstraction subsumes the three events (e.g., 'The children were playing'). Characteristic for this kind of link between the text base and its topic is the fact that *each* sentence entails (that is, semantically implies) the proposition 'A child is playing.' In other words, the topical macroproposition is a *generalization* with respect to the more specific propositions expressed by the text: Individuals are grouped into a collective argument, and the predicate is a generalization of the more specific predicates.

2.4. MACRORULES

2.4.1.   On the basis of these different examples we now try to formulate some more general rules that link textual propositions with the macropropositions used to define the global topic of a fragment. These rules are a kind of semantic *derivation* or *inference* rules: They derive macrostructures from microstructures. In our examples we have seen that in this kind of derivation semantic information is 'lost,' so the rules are *reductive* in certain respects. Second, the rules also allow certain elements to be combined in new, more complex units of information, so the rules also have a *constructive* nature. Finally, the rules take (sub-) sequences of propositions together by linking them to one macroproposition, which exhibits the *organizational* aspect of the rules. Semantic rules which have these properties and which link text bases, or fragments of these, with macropropositions are called *macrorules.*

In this section we first try to formulate these macrorules more or less informally and then their properties are specified more explicitly.

The simplest and at the same time most general macrorule is that of DELETION. It deletes all those propositions of the text base which are not relevant for the interpretation of other propositions of the discourse and

which do not denote facts which may be subsumed as normal properties of a more global fact which is denoted y a macroproposition of the discourse. This formulation of the macrorule of DELETION is more or less negative: It does not state which information is resulting from the inference operation but rather which information is lost in the operation. In a more positive sense, then, the same rule may be taken as a SELECTION rule, which selects from a text base all propositions which *are* interpretation conditions (presuppositions) of other propositions in the text base. We see later that the macrorules operate formally: They are applied if the condition is satisfied, which implies that the rule "sees" the further semantic information of the text base. In an empirically adequate cognitive model, of course, this is not the case: The rules formulated here are abstract inference rules of linguistic semantics, not the rules applied by a language user in the global interpretation of a discourse. Examples of this first DELETION/ SELECTION rule can be found in (16)—(18). We see that the rule operates on all kinds of so-called 'irrelevant details' of a description, that is, details that do not contribute to the construction of a theme or topic.

The second macrorule is merely a stronger variant of the first macrorule. In our previous examples, we see that sometimes text bases may feature propositions which within a strictly local range denote facts which are conditions, components, or consequences of another fact denoted by another proposition of the text base, usually the previous or following proposition, for instances as we have seen in (15). This means that apart from this local connection, the proposition does not condition the sequence of events at a more global level: No other propositions are interpreted relative to that proposition. In this case we speak of STRONG DELETION, whereas the first rule may be called WEAK DELETION. The first rule deletes irrelevant detail; the second, *locally relevant* detail. The same holds for the positive (SELECTION) formulation of this rule. Instead of making a difference between strong and weak deletion (or selection) rules, we may, and do in general, simply use one deletion rule, because locally relevant detail may be taken up into the first level of macrostructure and is simply deleted at higher levels where it no longer satisfies the relevance criterion.

The third macrorule is that of GENERALIZATION, which applies to examples like (19). In this case we do not simply leave out globally irrelevant propositions but abstract from semantic detail in the respective sentences by constructing a proposition that is conceptually more general. Respective individual participants may be *grouped,* whereas the predicates of the respective propositions are subsumed under a common denominator, denoting the *superset* of the property or relation denoted. The resulting macroproposition denotes a fact or situation in which the variation between participants and their properties is disregarded. To avoid having the resulting macroproposition be much too general and hence not represent the more

specific meaning of the whole sequence, we stipulate that this rule involves the *least possible* generalization (e.g., by taking the *immediate superset* or smallest grouping of predicates or individuals, respectively). We see that in both the DELETION and the GENERALIZATION rules information is left out in the resulting macroproposition. In the first case, however, we simply leave out whole propositions, whereas in the second case we leave out meaning components of predicates, due to abstraction.

The fourth rule is that of CONSTRUCTION. In this rule propositions are, so to speak, 'taken together' by substituting them, as a joint sequence, by a proposition that denotes a global fact of which the micropropositions denote *normal components, conditions,* or *consequences,* as in (13). In other words, in this case the *joint* sequence of propositions *defines* the macroproposition. The macroproposition denotes a more or less stereotypical sequence of events, an episode of which it is conventionally known what properties and facts are usually associated with it. We later investigate the nature of this kind of knowledge in more detail, as it is cognitively organized in *frames* or *scripts.*

Note that the CONSTRUCTION rule may have the appearance of a DELETION rule in those cases where the macroproposition is itself expressed in the text, as is the case in (13). This need not be the case however. The particular character of the CONSTRUCTION rule is, indeed, that a *new* proposition must be constructed, involving a new predicate to denote the complex event described by the respective propositions of the text. In this case the local propositions may well be relevant for the interpretations of another local proposition in the text. Thus, I may construct the proposition 'I took a plane to New York' as a macroproposition representing globally a complex action in which all kinds of detail are involved, such as going to the airport and checking in. Some of these facts (e.g., obtaining a boarding ticket) may however be relevant for the fact of giving the boarding ticket to some airline official later in the sequence; the same for luggage tickets. Hence, such propositions may be sequentially relevant but not at a more global level *unless* the proposition would determine the interpretation of a later proposition that would itself be identical with a macroproposition. Note that the global proposition may be construed only on the basis of conventionally known aspects of the global event, that is, of propositions occurring in a knowledge frame. Textual sequences containing propositions which denote facts that are not conventionally known, such as meeting an old friend at the airport when you are leaving, are not handled by this rule. In that case either such propositions are also a macroproposition (e.g., by the simple fact that they are not 'reduced' by the construction rule or another macrorule) or else they merely denote details of my plane trip and will then be taken care of by DELETION or by GENERALIZATION.

We see that we also need a rule that leaves propositions 'intact' by admitting them directly at the macrolevel. In that case we have the application of a ZERO

rule, which yields the same proposition at a macrolevel which occurs in the microlevel. The ZERO rule is especially important in all kinds of (very) short discourses (e.g., one-sentence discourses) where microstructure and macrostructure simply may coincide: Everything said in that case is equally relevant or important, as in simple orders like "*Come home!*" We see that the ZERO rule is a variant of the SELECTION rule.

2.4.2.   Before we make the macrorules more precise, we need some further more or less intuitive observations about their role in the global reduction and organization of discourse meaning. What we have now is that a sequence of propositions may be subjected to one or more macrorules, such that subsequences of propositions are mapped onto macropropositions at another level, as in Fig. 2.1. Here 10 propositions of the microstructure of the text are mapped onto three macropropositions, which we denote by uppercase letters. Both sequences are linearly ordered. However, macrorules also operate *recursively* as soon as the propositional input allows it: The macropropositions of the first macrolevel may again be taken care of by DELETION, GENERALIZATION, or CONSTRUCTION, yielding a still more global macroproposition at a second macrolevel. This means that we cannot speak about 'the' or 'one' macroproposition of a text but should specify the *level* of each macroproposition. We build in the following constraint however: Substitution by a (different) proposition makes sense only if the macrorule is applied on more than one proposition. This constraint means that we do not try to reapply rules on one macroproposition, so that we avoid losing specific information. In other words, a proposition like 'I took a plane to New York' would not be generalized further to 'I did something.' Application of macrorules, as specified earlier, should reduce and organize information but only up to a certain *upper bound.*

Another important aspect of macrorule application is the *order* of the rules involved: Do we first apply DELETION and then the other rules, or first CONSTRUCTION and then the DELETION rules and GENERALIZATION? Before we have made further analyses, this question is difficult to answer. Speculatively we could say the following however: If we would apply (strong)

Pi Pi' P2, *P3,* P4,   *P5,* **P6,** P7,   Ps, Ps,   *P10*

FIG. 2.1.

DELETION, we could loose certain constituent details that are necessary for the macrorule of CONSTRUCTION to operate (e.g., if we would delete 'walk to the train' from a sequence with the topic '*A* takes a train,' we might well not have enough information to apply CONSTRUCTION. Hence, we first apply CONSTRUCTION to see whether subsequent propositions can *jointly* be taken as representations of facts that constitute a global fact. The propositions that are left over may then be deleted if they represent locally or globally irrelevant facts. If CONSTRUCTION does not apply, we first apply GENERALIZATION and then the DELETION/SELECTION rules. We have to see later whether and how these DELETION/SELECTION rules are ordered, but again speculatively it seems as if irrelevant details are left out before locally relevant detail is left out. Note that in a cognitive model, where a language user may not yet have access to the rest of the discourse, the ordering of the rules may be different, as we see in Chapter 6.

Next it is assumed that macrorules apply on the *explicit text base,* i.e., the text base that is made coherent by the interpolation of propositions from world knowledge. If this would not be the case, the information input for the (formal) macrorules might be insufficient.

We then have to face the problem that in the GENERALIZATION and CONSTRUCTION rules 'new' global information must be formed, with higher-level predicates. Both formally and cognitively it may be assumed therefore that macropropositions and hence a topic can only be constructed *if indeed there exist more global concepts.* The same holds for stereotypical episodes as represented in our knowledge by frames or scripts: We have seen that the CONSTRUCTION rule operates on them, and if no conventional higher-order concept organizes an episode, the rule cannot apply. Note that in this semantic formulation we are speaking about the existence of *concepts* and not of *words* of a natural language; it may be the case that higher-level concepts and macropropositions cannot be directly expressed in some natural language.

Finally, it should be stressed that the macrorules were formulated, so to speak, *in vacuo.* For instance, the very notion of relevance used previously is not a general and objective notion but depends on all kinds of *contextual* factors, such as the knowledge, beliefs, tasks, goals, and interests of language users. In a cognitive model of macrostructures, therefore, we must account for the fact that language users may arrive at different macrostructural representations on the same text, even if under normal communicative conditions these macrointerpretations are more or less similar. Formally speaking, this means that the application of the macrorules may depend on a monitoring *schema,* which predetermines what the relevant information of the text is. Since these schemata are a property of the communicative context and determine the processing of the discourse by language users, however, we discuss them in Chapter 6.

2.5. EXAMPLES OF MACROANALYSIS

2.5.1.   On the basis of some simple examples, we have informally formulated some of the macrorules that map microstructures onto macrostructures. We have also made some speculations about specific constraints on macrorules. To test our hypotheses, however, we must make a number of analyses on different kinds of texts. The analysis of macrostructures in texts and of the ways such structures are derived from the microstructure are simply called *macroanalysis.* Before we are able to make a more or less formally explicit analysis, we first need some further semi-intuitive analyses, using the macrorules specified previously, to see whether they are correct, whether further rules are needed, in which order they apply, and what other constraints operate on them.

   If the hypothesis of macrostructure is correct, it should apply to all possible coherent discourse types. Yet, macrostructure is an abstract semantic notion. This means that in actual discourses (e.g., everyday conversations or poems) it may well be the case that there is no or merely a fragmentary macrostructure. The empirical claim is just that in general, and conventionally, discourses are globally coherent. The actual acceptability, or rather the acceptance, of a particular discourse without a macrostructure is not a counterexample against this assumption, no more than the acceptance of an ungrammatical sentence is a counterexample against sentences having syntactic structure. It should also be seen whether macrorules operate in a different way in different kinds of discourse in order to learn whether the rules are sufficiently general. In that case we may also see whether there are specific constraints or other variations over different discourse types.

2.5.2.   We start our analysis with *complex stories* (e.g., fragments of a crime novel). The advantage of this choice is that such discourses are relatively context-independent. We have assumed previously that the cognitive formation of macrostructures is not only dependent on knowledge but often also on our interests, tasks, attitudes, or beliefs. In general, these also play a role in story comprehension but in a less specific way as in actual context of communication such as daily conversation or newspaper texts. Moreover, stories are mostly about human action and social interaction, which provides additional ways of accounting for the global structures involved, due to the importance of knowledge frames and the role of plans and purposes. In Chapter 3 we will discover that such global semantic aspects of stories are further related to the schematic or superstructural aspects of narrative. Finally, we see that story analysis is closely linked to the macroanalysis of *(inter-)action,* an issue that is dealt with in Chapter 4.

2.5.3.   We begin with the first fragment of a crime story by James Hadley Chase, *Tiger by the Tail* (1966):

(20) (a) A tall slim blond in a white summer frock walking just ahead of
        him, caught Ken Holland's eye.
   (b) He studied her, watching her gentle undulations as she walked.
   (c) He quickly shifted his eyes.
   (d) He hadn't looked at a woman like this since he had first met Ann.
   (e) What's the matter with me? he asked himself.
   (f) I'm getting as bad as Parker.
   (g) He looked again at the blonde.
   (h) An evening out with her, he thought, would be sensational.
   (i) What the eye doesn't see, Parker was always saying, the heart
       doesn't grieve about.
   (j) That was true.
   (k) Ann would never know.
   (l) After all, other married men did it.
   (m) Why shouldn't he?
   (n) But when the girl crossed the road and he lost sight of her, he jerked
       his mind back with an effort to the letter he had received that
       morning from Ann.
   (o) She had been away now for five weeks, and she wrote to say that
       her mother was no better, and she had no idea when she was
       coming back.

The fragment is rather stereotyped, following the usual Chase theme of sexual obsessions or frustrations in (rather weakish) men, dominated and lured by 'sensational' but 'reckless' femmes fatales. In this story our 'hero' (Ken Hollander) is involved in the murder of a girl he went to see, after many hesitations, upon advice of a bank colleague (Parker), during the absence of his wife. This last sentence more or less expresses the main macrostructure of the beginning of the novel and provides the general 'thematic setting' for the analysis of the first fragment. Clearly, an *explicit* analysis of the first chapters of the story should *prove* that the summarizing sentence is an adequate expression of the global topic of the beginning of this story. But, as we said earlier, in this stage our analysis is informal and exploratory.

   We discuss the application of macrorules by following the respective sentences (a) to (o). Since macrorules in an abstract semantic model also have access to the further information in the text, we supply this information ourselves, when needed. We see that in this case the cognitive model might be rather different, although the macroprinciples involved are the same. For instance, we see this in the very first sentence. A reader may set up the hypothesis that the blond girl is a (main) participant in the story and hence

part of the first (main) macroproposition. This is not the case, however. The girl only appears here and is introduced merely as a participant in a fact that exemplifies the more general situation of the protagonist, Ken Holland (K H). We see shortly what kind of macrorule is applied here to account for this aspect.

Sentence (a) allows for the application of both GENERALIZATION and DELETION. The white summer frock will no longer be mentioned and is not further relevant here, so the phrase expressing it may be deleted. The propositions expressed by the first phrase may be generalized to 'a beautiful girl' (at least in a certain evaluation system; see the following). The 'walking' idea is relevant to interpret the next sentences and may therefore not be eliminated by WEAK DELETION but must, together with the 'gentle undulations' in (b) be eliminated by STRONG DELETION and by GENERAL-IZATION ('beautiful girl'). The reference to 'caught his eye,' 'studied,' 'watching,' 'shifted his eye,' and 'looked again' (g), may be mapped by GENERALIZATION to 'looked.'

A first interesting point to be noted here is that we not only establish macroinformation on the basis of explicitly expressed propositions but also try to supply information that would fill the categories of a global FACT schema. In this case, we might infer for instance for the category of Circumstances that the events take place in summer or in a warm town (by 'summer frock') and that the events take place, initially, in the street [by 'walking,' confirmed by (n)]. First of all we thus have the macroproposition: '**KH** looks at a pretty girl in the street.'

Sentence (c) introduces a (momentary) break of this topic, by mentioning the forebearance of a previous action (not looking) and the motivation for it (by implicit thought representation) viz., not being used to looking at girls due to Ann or rather the fact that he is married (inferred from the rest of the fragment, and later confirmed in the novel). This reason is backed up by the self-criticism in (e) and (f). That this is merely an intermediary thought, however, is shown by (g) and (h) where the 'looks at girl' theme is reinstated. The upshot of (c) to (e), then, should be something like '**KH** has (positive) moral feelings.' This brings us to a next interesting question. Of course, the details of the thought of the hero are globally irrelevant, which would delete (c), (d), and (e). However, the general information conveyed by these sentences is about the *character* of **KH**. In other words, we may abstract by GENERALIZATION from certain actions of participants, not only by constructing global actions or deleting irrelevant ones but also by using them in order to construct a global feature in the character of the participant. In our case this also holds for the first sentences: **KH** likes beautiful women; here the 'guilty conscience' theme is added to this, which is part of the more general character trait of (positive) moral attitude. We here have a rather specific type of GENERALIZATION, which we call INTERPRETATION or EVALUATION. Thus,

INTERPRETATION is a macrorule that associates certain global mental or personality features of persons with their respective actions. Going through a novel, we may thus take both the relevant and the irrelevant actions of participants as *indications* or *expressions* of a more global characteristic. This global characteristic may well become part of the macrostructure. In our example, for instance, the global feature dominates the whole first chapter: **KH** hesitating whether to "kick over the traces" or not. Sentences (i) to (m), which are descriptions of **KH**'s mental argumentation, should as such either be deleted or be generalized to 'there is no reason not to go out with another girl,' but may also be interpreted globally as a manifestation of this hesitation. Sentence (n) then changes from the first event (seeing this girl in the street) to the next global fact (viz. the *situation* of **KH**, the absence of his wife, and his emotional reaction to this absence). In this case, states of mind are a normal component of a personal situation, and receiving a letter is a normal component of an absent close relative. The reason for this absence (mother is ill) is a normal condition and may hence be integrated into the global theme of 'absence of wife.'

Important in the global interpretation of this fragment is also the instantiation of a well-known *social frame* (viz., that of 'unfaithfulness'). In such a frame we have a set of participants (wife, husband, third party), a set or sequence of typical events and actions, and a number of conventions. Looking at girls, wanting to date them, and having guilty conscience are typical facts in this (traditional) frame. The frame at the same time provides the background for the global *purposes* of the main participant (viz., realizing the *goal* of changing the state of frustration by dating a girl, which will eventually be *planned* by **KH**). This passage in fact provides the first elements for the *motivation* underlying this plan and purpose and exhibits normal features of the initial state (of frustration) leading to such a motivation, which as such is again based on elementary *needs* (social contact, sex, love, etc.), *wishes,* and *preferences.* Since these motivations are 'normal' conditions for having a date with a girl, they may at a more general level be further integrated by CONSTRUCTION.

From this discussion we may conclude that a macroanalysis takes place at several levels: We try to delete irrelevant detail, generalize, and construct global actions, but at the same time we make inferences about the background of the events, the character of the participants involved, the social frame being instantiated, and so on. In other words, macrorules are not simply operating by deletion on given information but often actively try to construct new, more global, information at another level. This may be done by mapping FACT-organized propositions onto MACROFACT-organized macropropositions: The rule isolates the participants in the story who are also participants in a macrostructural event or action, constructs the macroaction, constructs modifiers for the participants (viz., their general characteristics), and finally

determines the general situation such as time, place, background, and atmosphere. Next, the MACROFACT is taken as an instantiation of a FACT in known social frames, which provides the global goals, strategies, possible plans, and general preferences of the participants. In our case, the MACROFACT: 'KH is frustrated,' being an instantiation of 'X is frustrated,' is a normal condition, in the social frame of 'kicking over the traces,' for further MACROFACTS, such as 'KH dates a call girl.'

From these few examples we see first of all that the derivation of macropropositions is very much *socioculturally* determined: Given certain acts and events, it definitely depends on social frames and cultural *norms* and *values* what we consider to be the global event or action now going on. Of course we observe this most clearly as soon as we make inferences about the global personality characteristics of story participants. Thus, in our case, we judge KH to have traditional marriage morals, often accompanied by the typical male street behavior, associated with the usual guilt feelings. Such may be the global elements from which we construct a represented personality, much in the same way as we would do in everyday interaction, by making inferences from the actions of others. In a similar way as we have general knowledge about action and event schemata, we may have general *personality schemata,* which organize the various action types, behavior, and appearance of persons with whom we interact. In our example we have the typical difference between the rather insecure KH, who still more or less loves his wife and therefore hesitates to give way to his frustrations, and on the other hand his colleague Parker who only thinks of how he (or his colleague) could go out with a girl, with the traditional secrecy condition ("what the eye doesn't see, the heart doesn't grieve about."). We ignore the problem here of what such a personality schema could look like. Important for our discussion is merely the fact that it allows us to construct a global characteristic of persons, or 'type,' which is important to understand, evaluate, organize, expect, and predict the various actions of story participants in given (represented) social contexts.

Besides the usual action frames, we now have complicated personality schemata, and in both cases it has appeared that even with very scanty indications in the text, we are able to make a rather complex global structure, representing the probable global event going on, the personalities of the participants, the social context and frame being relevant, etc. Some of the inferences involved are rather subtle and depend on the particular knowledge, beliefs, attitudes, values, and norms of the reader. Obviously, a female reader and especially a feminist would read this passage in a different way as a male chauvinist. This highly important cognitive component in comprehension, both at the micro- and at the macrolevel is accounted for in Chapter 6 where the psychological aspects of macrostructure formation are dealt with. The various contextual factors determining the construction of macroproposi-

tions individually, such as knowledge, beliefs, attitudes, tasks, interests, values, and norms, is called the *cognitive set* of the language user. This cognitive set is different for different readers/ hearers, at different moments and for different texts. In this chapter, thus, we abstract from the many cognitive differences between language users, which may lead to partially different macrostructures of the same text, in the same way as we have abstracted from processes, memory limitations, and comprehension strategies. We merely take sequences of propositions, building sequences of FACTS and, if necessary, propositions from abstract frames or other knowledge of the world. In other words, formally speaking, a cognitive set is merely a set of propositions. Note that in this last sentence the first notion of 'set' means something like 'disposition' or actual situation or 'state,' whereas the second notion is that from mathematical set theory. We come back to the psychological aspects of cognitive sets later.

Let us now finally summarize these remarks by giving a first-level macroproposition list of the story fragment informally analyzed previously

(21) (a) **KH** is looking at a beautiful girl in the street [from (a), (b), (g), (h)
        by GENERALIZATION].

    (b) He has a guilty conscience about that because he is married [from (c), (d), (e), (f), by
        CONSTRUCTION].

    (c) He is frustrated because his wife is absent (for some weeks to see
        her ill mother) [from (n), (o), and the following fragment, by   CONSTRUCTION].

In a second round of macrorule application we could take (21, a) as a normal component of being a frustrated male and hence delete it or generalize it to the general attitude of our story protagonist (viz., as a condition that will eventually lead to dating the call girl). Given a certain social frame, we can even take (21, b) as a normal consequence of this action, given the information that **KH** is married. However, to understand his personality and his long hesitation to go out with another girl, we would need to infer (21, b) from a certain marriage frame anyway. In other words, we do not delete or generalize those macropropositions that later in the story are normal conditions or presuppositions for the interpretation of subsequent (macro-) propositions. In (21, c) the reason for the absence at the first level would be to organize the propositions denoting the mother in-law of **KH**. At a more global level, only the absence of **KH**'s wife would be relevant: A normal condition could be deleted. We see from (21) that as a result of the macrorules we do not have a number of atomic propositions but rather schemata of propositions that we have called FACTS: Looking at a beautiful girl in the street is just one fact and feeling guilty about it and being frustrated because of the absence of one's wife are two more facts. Hence, we not only operate the macrorules on propositions but at the same time organize macropropositions

into MACROFACTS. At this level of description of the initial fragment of the novel, we still have FACTS that are close to those represented at the microlevel. As soon as the semantic structure becomes more complex, we need higher-level FACTS (e.g., 'KH is dating a call girl,' which organizes the propositions of many pages of the book).

In the MACROFACTS constructed from this passage we may indicate the global modifier for the protagonist, as soon as we have enough information to do this. Similarly, we may add that it is summer or a warm town and that some of the later scenes take place in a bank, at **KH**'s home, or in the home of the call girl. The modifiers at that level may be EVALUATIONS, inferred from the (macro-)actions of the persons involved. In the same way as we should specify the general knowledge frames that are the basis for the CONSTRUCTION rule, we now should specify the attitudes, norms, or values that determine the particular evaluation. In other words, (macro- and micro) comprehension of discourse is relative to the cognitive set of language users.

From our example analysis we may also make some conclusions about the possible *ordering of macrorules.* We have observed that irrelevant local detail is first of all taken care of by WEAK DELETION. Second, GENERALIZATION takes a number of actions or properties of participants together and represents them at a sufficiently abstract level. The CONSTRUCTION rule then takes the major conditional and component events, states, or actions of a sequence and yields global actions, personality, and setting. STRONG DELETION then, finally, takes care of the information which is locally relevant but which globally is no longer relevant in our example (e.g., looking at a particular girl). That STRONG DELETION comes last may be expected: We have assumed earlier (p. 49) that in fact it may simply be DELETION at higher levels. Further observations will have to show whether this ordering has a more general character.

Finally, we may conclude that the CONSTRUCTION rule operates on propositions and FACTS, yielding global FACTS, which means that it results in different kinds of global information:

(a)   global setting
        (i) situation, place, time / period
        (ii) atmosphere, weather, etc.
(b)   global state descriptions
        (i) persons, personality; mental / emotive situation
        (ii) general conditions of events and actions
        (iii) objects involved in events and actions
(c)   global events
        (i) global (inter-)action and their purposes / goals, plans
        (ii) global processes and events
(d)   global modifiers and evaluation of (a)—(c).

2.5.4.   To see whether the macrorules have a sufficiently general character, we should also try to apply them to other types of discourse. Previously, we have given an analysis of a fragment of a complex story. The particular narrative aspects involved (viz., underlying narrative superstructures) are dealt with in Chapter 3. It may be the case, however, that in other types of discourse the rules also have to apply to different kinds of semantic information and not only under the constraint of specific superstructures. The relevance of persons, central participants ('heroes'), and complicating actions in our example is in part determined by narrative schemata but also by the very nature of semantic information in the text about actions. Let us therefore see whether a different type of discourse has similar specific semantic information and whether the macrorules also apply there.

Instead of a narrative text, we take an *expository text.* Often such texts have an argumentative superstructure, to be discussed in Chapter 3. An expository text need not be about actions or persons but may be about objects or abstract ideas. For this example, our analysis, given in Table 2.1, may be a little more explicit, using the notation introduced in Chapter 1, because the various macrorules need no longer be informally explained. Note though that the analysis is not yet formal in the strict sense, not only because the macrorules are not applied algorithmically but also because all relevant knowledge information is not explicitly spelled out. The same holds for the 'translation' of the surface structure of the text into the underlying atomic propositions.

Bakkelash

A divided Supreme Court, on Wednesday, June 28th, finally delivered its long- awaited ruling in the controversial case of Mr. Allan Bakke, a white, would-be doctor who claimed his civil rights were violated by a medical school admissions scheme designed to help blacks and members of other racial minorities. Mr. Bakke's complaint, that he was wrongly excluded from the school because of his colour, had won widespread attention. His case was the focus of white resentment against "affirmative action": programmes in which, as whites see it, they must unfairly make way for less qualified minorities. On the other side, Mr. Bakke's challenge was seen by minority groups as a threat to years of progress in curbing discrimination by whites.

Given the legal difficulties of the case and its political importance, it was little surprise that the fine justices came to no single decision. In fact, there were six opinions. Justice Lewis Powell, a Nixon appointment and frequently a target of liberal criticism, read the leading opinion. The court gave Mr. Bakke a personal victory by ordering that he be admitted to the medical school. However, in establishing general principles governing "special admissions" programmes, the court ruled that race could be a consideration.

Some civil rights groups welcomed the decision on this point. Mr. Joseph Rauh, a veteran civil rights advocate, said the decision provided "legal concrete" for the disputed principle of affirmative action. Without such deliberate steps to

TABLE 2.1

Macroanalysis of *Bakkelash*

Micropropositions (atomic)	Macrorules	Macropropositions
1. delivered (x1, x2)	ZERO	delivered (x1, x2)
2. Supreme Court = x1	ZERO	Supreme Court = x1
3. divided (x1)	ZERO	divided (x l)
4. ruling (x2)	ZERO	ruling (X2)
5. long awaited (x2)	DELETION	
6. finally (1)	DELETION	
7. in (x2, x3)	ZERO	in (X2, X3)
8. case (x3)	ZERO	case (x3)
9. controversial (x3)	ZERO	controversial (x3)
10. of (x3, x4)	ZERO	of (x3, x4)
11. Mr. Allan Bakke = (x4)	GENERALIZATION	somebody = (x4)
12. White (x4)	ZERO	white (x4)
13. would-be doctor (x4)	GENERALIZATION	student (x4)
14. claimed (x4,15)	CONSTRUCTION	(l5) normal condtion
15. violated (x7, x6)	ZERO	violated (x7, x6)
16. civil rights (x6)	ZERO	civil rights (x6)
17. his (x6, x4)	ZERO	his (x6, x7)
18. admissions scheme (x7)	ZERO	admissions scheme (x7)
19. medical school (x8)	GENERALIZATION	university (x8)
20. has (8a, x7)	ZERO	has (x8, x7)
21. designed to (x7, 22)	ZERO	designed to (x7, 22)
22. help (x7, x9, xlo))	ZERO	help (x7, x9/ xlo)
23. blacks = (.xlo)	GENERALIZATION	(24)
24. members of (xlo, xll)	ZERO	members of (x9/x10, xll)
25. other minorities (xll)	ZERO/ GEN	minorities (x11)
26. racial (x, l)	ZERO	racial (x11)
27. [was] on (l, xl2)	DELETION	
28. Wednesday (X12)	DELETION	
29. June 18th = xl2)	DELETION	
30. complained (x4, 31)	CONSTRUCTION	normal consequence (31)
31. excluded from (x4, xl4)	GENERALIZATION	discriminates (x8, x4)
32. wrong (3I)	CONSTRUCTION	(3l)
33. school (x13)	ZERO	X8 = x13
34. because of (31, 35)	CONSTRUCTION	(31)
35. has[white] color (x4)	CONSTRUCTION	(31)
36. has won (30, xl4)	CONSTRUCTION	(9)
37. attention (x14)	CONSTRUCTION	(9)
38. widespread (xl4)	CONSTRUCTION	(9)
39. was the focus of (x3, xl5)	CONSTRUCTION	(9)
40. resentment (xl5)	CONSTRUCTION	(9)
41. white (xl5)	CONSTRUCTION	(9)
42. against (x15, x16)	CONSTRUCTION	(9)
43. affirmative action (x,16)	CONSTR./GEN	(22)
44. programes (xl6)	CONSTR./GEN	(18)
45. in (xl6, 46)	CONSTRUCTION	(43)(22)
46. make way (x17, xll)	CONSTRUCTION	(43)(22)
47. whites (xl7)	CONSTRUCTION	(43)(22)

TABLE 2.1 continued

	Micropropositions (atomic)	Macrorules	Macropropositions
48.	must (46)	CONSTRUCTION	(43)(22)
49.	unfair (46)	CONSTRUCTION	(43)(22)
50.	see as(x17, 49)	CONSTRUCTION	(43)(22) (9)
51.	less qualified (x11)	CONSTRUCTION	(43)(22)
52.	on the other side (53)	CONSTRUCTION	(9)
53.	see as (x11, 30, 54)	CONSTRUCTION	(9)
54.	threatens (30, x18)	CONSTRUCTION	(9)
55.	years of progress (x18)	CONSTRUCTION	(9)
56.	in (x18, 57)	CONSTRUCTION	(9)
57.	curb (x11, x19)	CONSTRUCTION	(9)
58.	discriminate (x17, x11)	ZERO/DELETION	(9)
59.	given (x19, and x20, 64)		given[x19, and X20, 64)]
60.	difficulties (x19)	ZERO/DELETION	[difficulties (x19)]
61.	legal (x19)	ZERO/DELETION	[legal (x19)]
62.	importance (x20)	ZERO/DELETION	[importance (x20)]
63.	political (x20)	ZERO/DELETION	[political (x20)]
64.	was little surprise (65)	DELETION	
65.	not (66)	DELETION	
66.	came to (x21, x22)	DELETION	
67.	justices (x20)	GENERALIZATION	(1)
68.	nine (x21)	GENERALIZATION	(1)
69.	decision (x22)	GENERALIZATION	(1)
70.	single (x22)	GENERALIZATION	(1)
71.	in fact (72)	GENERALIZATION	(1)(65)
72.	there were (x23)	GENERALIZATION	(1)(65)
73.	opinions (x23)	GENERALIZATION	(1)(65)
74.	six (x23)	GENERALIZATION	(1)(65)
75.	read (x24, x25)	GENERALIZATION	(1)(65)
76.	Justice Lewis Powell = x24	GENERALIZATION	(1)(65)
77.	opinion (x25)	GENERALIZATION	(1)(65)
78.	leading (x25)	GENERALIZATION	(1)(65)
79.	appointed (x26, x24)	DELETION/CONSTR.	/cpnservative (x24)
80.	Nixon = x26)	DELETION/CONSTR.	
81.	is a target of (x24, x27)	DELETION/CONSTR.	
82.	criticism (x27)	DELETION/CONSTR.	
83.	liberal (x27)	DELETION/CONSTR.	
84.	gave (x1, x4, x28)	DELETION	
85.	victory (x28)	DELETION	
86.	personal (x28)	DELETION	
87.	by (83, 87)	DELETION	
88.	ordered (x1, 88)	ZERO	ordered (x1, 88)
89.	admit (x13, x4)	ZERO	admit (x13, x4)
90.	however (87, 90)	ZERO	however (87, 90)
91.	ruled(x1, 91)	ZERO	ruled(x1, 91)
92.	race (x29)	ZERO	race (x29)
93.	could be (x29, x30)	ZERO	could be (x29, x30)
94.	consideration (x30)	ZERO	consideration (x30)

TABLE 2.1 continued

	Micropropositions (atomic)	Macrorules	Macropropositions
95.	in (90, 95)	ZERO	in (90, 95)
96.	established (x1 x31)	ZERO	established (x1, x31)
97.	principles (x31)	ZERO	principles (x31)
98.	general (x31)	ZERO	general (x31)
99.	govern (x31 x32)	ZERO	govern (x31, x32)
100.	programmes (x32)	ZERO	programmes (x32)
101.	special admissions (x32)	ZERO	special adm. (x32)
102.	welcomed (x33, x34)	ZERO	welcomed (x33, x34)
103.	civil rights groups (x33)	ZERO	civil rights groups (x33)
104.	Some of (x33)	ZERO	some (x33)
105.	decision (x34)	ZERO	decision (x34)
106.	on (X34, 90)	ZERO	on (x34, 90)
107.	said (x35, 109)	DELETION/CONSTR.	(101)
108.	Mr. Joseph Rauh = x35	DELETION/CONSTR.	(101)
109.	civil rights advocate = x35	DELETION/CONSTR.	(101) (102)
110.	provided (x34, x36, x37)	DELETION/CONSTR.	(101)
111.	legal concrete (x36)	DELETION/CONSTR.	(101)
112.	principle (x37)	DELETION/CONSTR.	(101)
113.	disputed (x37)	DELETION/CONSTR.	(101)
114.	affirmative action (x17)	DELETION/CONSTR.	(101) (43) (22)
115.	without (x38, 120)	DELETION/CONSTR.	(101)
116.	Steps (x38)	DELETION/CONSTR.	(101) (103)
117.	deliberate (x38)	DELETION/CONSTR.	(101) (103)
118.	[in order] to (115, 118)	DELETION/CONSTR.	(101) (103)
119.	bring in to (x1o/x11, x39)	DELETION/CONSTR.	(101) (103)
120.	mainstream (x39)	DELETION/CONSTR.	(101) (103)
121.	must fail (x40)	DELETION/CONSTR.	(101) (103)
122.	efforts to (x40, 122)	DELETION/CONSTR.	(101) (103)
123.	end (x40 X^{41})	DELETION/CONSTR.	(101) (103)
124.	inequalities (x41)	DELETION/CONSTR.	(101) (103)
125.	racial (X41)	DELETION/CONSTR.	(101) (103)
126.	think (x42, 120)	DELETION	
127.	many (x42)	DELETION	
128.	sanguine (x43)	GENERALIZACION	not (101)
129.	less (127)	GENERALIZACION	not (101)
130.	other civil rights groups (x43)	ZERO	other civil rights groups (x^{43})
131.	about (127, x44)	ZERO	about (127, x44)
132.	effects of (x 44)	ZERO	effects of (x44)
133.	for (128, 144)	DELETION/CONSTR.	(127)
134.	while (134, 144)	DELETION/CONSTR.	(127)
135.	upholds (x1, x45)	DELETION/CONSTR.	(127) (95)
136.	notion (X45)	DELETION/CONSTR.	(127) (95)
137.	general (x45)	DELETION/CONSTR.	(127) (95)
138.	135 = 138	DELETION/CONSTR.	(127) (95)
139.	could (139)	DELETION/CONSTR.	(127) (95)
140.	consider (x46, 140)	DELETION/CONSTR.	(127)
141.	is a factor in (x47, x48)	DELETION/CONSTR.	(127) (100)

TABLE 2.1 continued

	Micropropositions (atomic)	Macrorules	Macropropositions
142.	univertities (x46)	DELETION/CONSTR.	(127)
143.	admission (x48)	DELETION/CONSTR.	(127)
144.	race (x47)	DELETION/CONSTR.	(127)(91)
145.	rejected (x1, x49)	DELETION/CONSTR.	(127)
146.	schemes (x49)	DELETION/CONSTR.	(127)
147.	is only factor in (x47, x49)	DELETION/CONSTR.	(127)
148.	five of (x50, x1)	DELETION/GEN.	(1)
149.	Justices Powell, Stevens, Rehnquist, Steward, and the Chief Justice, Mr. Warren Burger = x50	DELETION/GEN.	(1)
150.	found wrong with (x50, 146, x51)	DELETION/GEN.	(1)(95)
151.	scheme (x51, 109)	DELETION/GEN.	(95)
152.	at (x51, x8)	DELETION/GEN.	(95)
153.	of (x8, x52)	DELETION/GEN.	(95)
154.	University of California = x52	DELETION/GEN.	(95)
155.	in (x52, x53)	DELETION/GEN.	(95)
156.	Davis = x53	DELETION/GEN.	(95)

bring blacks and other minorities into the mainstream, efforts to end racial inequalities, many think, must fail. Other civil right groups were less sanguine about the effects of the court's ruling. For while upholding the general notion that universities could consider race a factor in admissions, the court rejected schemes in which it was the only factor. This was what five of the court, Justices Powell, Stevens, Rehnquist, Stewart, and the chief Justice, Mr. Warren Burger, found wrong with the scheme at the University of California's medical school in Davis.

In 1973 and 1974, Mr. Bakke failed to get a place at the school, which reserved 16 of its 100 available places each year for "disadvantaged" applicants, meaning, in practice, blacks or members of other racial minorities. Mr. Bakke was one of 35 "normal" applicants who just missed gaining admission. Had the 16 special places not been reserved, Mr. Bakke arguably stood a slightly less than 50% chance of a place.

Justice Powell argued that the Davis medical school's "two-track" admissions system involved classification by race of the sort the court could not tolerate. He found that it disregarded an individual's rights under the l4th amendment, which gives equal protection for ah under the law. The other four justices arrived at a similar conclusion by a different route. The Davis scheme, according to an opinion written by Justice Stevens, was ruled out by Title VI of the 1964 Civil Rights Act. Among other things, this says: "No person. . . shall on the ground of race, colour or national origin be excluded from participation in.. . or be subject to discrimination under any programme or activity receiving federal financial assistance." Mr. Bakke was excluded from the medical school

for his colour; the medical school (like many professional schools) gets federal funds; so, the justices argued, an act of congress, not the constitution, was enough to dispose of the Davis "special admissions" programme. It is one of the sharper ironies of the case that the Civil Rights Act of 1964 was a milestone in the legal protection of blacks against discrimination by whites. It could be invoked by opponents of "reverse discrimination" because its language, like the law generally, is colour-blind.

Justice Thurgood Marshall, the court's first and only black member, differed sharply with Justice Powell. During most of the past 200 years, he said, the constitution, as interpreted by the court, did not "prohibit the most ingenious and pervasive forms of discrimination against the negro." Now, he went on, "when a state acts to remedy the effects of that legacy of discrimination, I cannot believe that this same constitution stands as a barrier."

Justice Marshall joined a liberal minority, including Justices Brennan, Blackmun and White, in arguing that the Davis medical school's special admissions system be allowed to stand and that Mr. Bakke should not be ordered admitted. It was with this liberal foursome that Justice Powell stood in establishing the court's general ruling, that race could be used as one consideration in admissions. In particular, the Harvard "special admissions" programme, which does not use quotas of any sort, pools all applicants together, but does single out blacks in an effort at racial diversity, was upheld as a lawful standard.

There is bound to be much argument about the acceptability of special admissions programmes failing in between. The Bakke decision pointed out no very clear lesson about a range of other affirmative action schemes involving hiring, building contracts, teaching and police. However. there is a building contracts case pending on which, before long, the court may have to decide.

Mr. Bakke himself, now 38, became an engineer after his disappointment at the Davis medical school. A number of other medical schools to which he applied five years ago rejected him then because of his age, which was high for a medical student. However, his lawyer says he will be going to medical school this autumn. An intriguing question is the legal position of the other *30* or so "normal" applicants who applied to Davis medical school but failed to get in because of the places reserved for blacks.

There is much legal argument in Justice Powell's long, leading opinion. Considering the passion and resentment the issue of "reverse discrimination" has evoked, the court caused no surprises in delivering a ruling that pointed in two directions at once. (From: *The Economist,* July, 11978, PP. 3 1—32.)

This approximately systematic application of the macrorules may of course have different variations. At some points alternatives have been indicated. Sometimes we may simply delete information or take it as a particular case of a more general point, which we find by GENERALIZATION or CONSTRUCTION. The notation, as we argue in Chapter 1, is deliberately simplistic in order to be able to make analysis by hand feasible. We simply use atomic propositions and neglect some important logicosemantic differences (e.g., between

predicates and quantifiers). Also, we do not attempt to use a more primitive semantic language but use the lexemes expressed in the text.

Another observation we can make for this fragment pertains to the typical structure of newspaper articles, (viz., the fact that the global macrostructure is often at least partially expressed in the beginning of the text, as a general introduction for the rest, where the main points are further specified).

At many points the macrorules could be applied further and thus yield a still more abstract macrostructure. Let us see however what the rules at this level have produced viz., by 'translating' the respective macropropositions in a possible summary. Such a summary may be taken as an expression of a macrostructure.

Macrostructure of the Text

1. A divided Supreme Court ruled in a controversial case where the civil rights of a white student were claimed to be violated by university admission schemes.

2. These schemes are designed to he1p members of racial minorities groups.

3. The student had complained that he was discriminated by the university.

4. The Court ordered that the student be admitted.

5. However, it also ruled that race could be a consideration, in establishing general principles governing 'special admissions' programs.

6. Some civil rights groups welcomed the latter decision; others did not (because actual admission schemes were rejected).

We see that the semisystematic application of the rules produces an acceptable summary of this fragment of the text. Of course, fully algorithmic or automatic application of the rules would require specification of an enormous data base of political knowledge. Some examples may be given of rules based on such knowledge. In (23) we may generalize only if knowledge is provided that blacks are a minority group in the United States. We must know in (31)-(35) that discrimination may consist of excluding people from a school because of race/ color. In that knowledge system we also have the item that some whites will resent special admission programs, whereas minorities groups will think positively of them. This information, taken together, may be constructed as the general concept of 'controversial,' embedded in the first MACROFACT.

Next, we must know that the Supreme Court consists of nine justices and that votes need not be identical. We must know that a justice appointed by Nixon will probably he conservative and that conservatives are often against prominorities programs. We must understand why some groups we1come the decision, whereas others are critical, and why the reasons given apply in this case.

Roughly speaking, then, this kind of discourse describes some political event (e.g., a decision of a government or an important court about an

important social matter). The details of the text then describe the original conditions of the decision (not in our fragment), the way the decision was taken, what the political stands are on the social issue, and what the precise reactions are of the groups being affected by the decision. In a comment or title (cf. "Bakkelash") the author may also give an evaluation of such a political decision. The macrorules, thus, operate on detailed actions and social events and assign general notions (e.g., discrimination), generalize standpoints to 'for' and 'against,' and construct the general reactions on the basis of what was done and what was said by different parties. Crucial, however, is that the macrorules select or construct those propositions or FACTS that are indeed socially most *important or relevant*. In our case this is the decision of the court and not, for instance, the data of the decision, the exact division of the votes in the court, or the words of a liberal advocating admission programs. The importance, semantically, is determined by the fact that the (macro-)propositions representing the relevant information are conditioned by other macropropositions and also condition other macropropositions. Thus, the claimed discrimination of whites by admission programs is the condition for the decision (its 'case'), whereas the various reactions are the consequence of the decision. In other words, the Supreme Court decision is the main FACT of the macrostructure of this text. As soon as we would apply beliefs, values, or attitudes from different cognitive sets (viz., liberal or conservative 'sets'), we might find different interpretations and global evaluations of the ambivalent Supreme Court decision: 'Supreme Court: race factor in admission programs' or 'Supreme Court: no discrimination of whites,' etc., as possible headlines in various newspapers.

From this analysis we may conclude that the various macrorules also seem to operate on non-narrative texts, such as political news: Instead of persons we often have the construction of groups; instead of the construction of personality, we also have the construction of global political opinions, stands, or issues. Due to our social and political knowledge we know which persons and institutions are important, how their various actions organize into socially relevant actions (official decisions), and what the general political 'backgrounds' of such actions are.

2.5.5.   Although in the discourse analyzed in subsection 2.5.4 we still have a certain amount of action and event description, with various human participants, their roles, actions, and interactions, *expository discourse* may also typically be about states of affairs, objects, abstract ideas, etc. Well-known examples are the discourses of scientific papers, textbooks, encyclopedias, and manuals. The more specific schematic aspects of such types of discourse are studied in Chapter 3. Important for our discussion is merely the observation that many of these types have an *argumentative* structure, (viz., a schema consisting of various kinds of premises and a

conclusion). Another property may be the use of more or less general observations or theses, which are illustrated or backed up by observations of concrete examples. In general, expository discourse exhibits a semantic structure in which the various structural properties of any interesting aspect of the world is systematically treated: objects or notions involved, their properties and relations and their general organization; what happens if we interfere in states or processes, etc.

We briefly illustrate that the macrorules postulated and refined previously also hold for expository discourse and take a *scientific paper* as our example. The discourse we use is the general editorial introduction of a reader in the social psychology of everyday life. Besides being an introduction to so problems treated by the papers collected, this introduction focuses on the possible research methods in social psychology. Before discussing the various ethical issues involved in doing research in social situations, the author touches upon the well-known problem of whether social psychology should be based on data from laboratory experiments or on data from field experiments.

Clearly, one can understand such a fragment only when one knows about scholarly activities, conventions, and values in general and those of the social sciences in particular. The same holds for the formation of macrostructures: To know what is relevant or important we must know what is considered to a relevant problem, issue, or notion in the field. We must know what kind of facts illustrate a general thesis, what the general intention or purpose of the author may be, etc.

As for the notation in this analysis, given in Table 2.2, we simply segment the text fragment into sentences, expressing FACTS, and do not use the cumbersome (though already extremely simplified) atomic proposition notation that we have illustrated.

We need not separately specify what the macrostructure of this fragment is: it is the sequence of (complex) macropropositions (or MACROFACTS) in the third column. Characteristic of this passage is the fact that the macrorules in the first analysis hardly provide any reduction: We go from 24 to 18 FACTS. This is because the various points in the argument are equally important and because the exposition itself is mainly a summary of the discussions of field versus laboratory experiments. Clearly, Sentence 2 either is irrelevant and can hence be deleted or can be considered as a normal consequence specification of M1. Sentence 5 may be taken as an explication of Sentence 3 (= M3) or rather of the notion of 'self-report.' Sentence 6 provides specification of the 'unreliability' of self-reports and may therefore substituted, by CONSTRUCTION, by a sentence featuring this notion. Sentence 7 is a further specification of 6 or M6 and may hence be deleted or at least generalized. Sentences 9 and 10 are nice examples of illustrations of 8 (M7) and may hence be deleted. Sentence 11 is more or less the central

macroinformation of this passage (viz., the conclusion from the other global FACTS). Sentences 17 and 18 may be taken as more specific variations of 16 (M11), to which they may be reduced by CONSTRUCTION. Here again we have a typical example, as for Sentence 6, of the importance of knowledge involved: A social scientist knows what controlled conditions involve. Of course, in second analysis we may further reduce the information to the most important macropropositions, as follows:

M2
  1: Both in field experiments and in laboratory experiments there are advantages and disadvantages (M l0).
M2
  2: In both cases we must study actual behaviour and not merely self-reports (M8). .
M2
  3: Self-reports may he unreliable (M5).
M 2
   4: In the laboratory, experiments may be well-controlled (M 16).
M2
  5: But then there is no natural situation and the subjects behaviour maybe an artifact of the setting (M14-M16)
M2
  6: In the field we have a natural situation but no control (M17).

The other macropropositions of the first level may be deleted or be constructed as normal conditions, components, or consequences of the higher-order macropropositions. Since M1/2 is implied by M2/4-6, we may delete it, although at a still higher level it would precisely be the generalization of M 2/4-6. In that case, however, the argumentation would no longer be relevant and the macrostructure not specific enough.

2.5.6.   Our last example of macroanalysis is the text of an *advertisement*. In this analysis (see Table 2.3) we merely analyze the textual fragment of the total message and ignore the role of the photograph, and we do not pay attention to stylistic, rhetorical, or argumentative aspects of advertising discourse. In our example, an advertisement for the Berlitz language teaching method (see Fig. 2.2), the *argumentative* structure, is very prominent, and we have to come back to the relation between macrostructures and this kind of Superstructure in Chapter 3. It appears, for instance, that the isolation or construction of macropropositions should follow the canonical schematic structure of the argument, which indicates which textual 'functions' are relevant for this kind of discourse.
Clearly, the discourse fragment of many advertisements may be rather short or even totally absent, which would make a macroanalysis superfluous. For more extensive advertisements, however, it is necessary to show what the global meaning of the text is, especially in order to be able to specify the global *pragmatic* functions of the discourse in a process of persuasive communication. A global proposition like BUY *X* or USE *Y* would in that

OJO!!! Falta TABLE 2.3, pags. 70 completa y mitad de 71

respect pragmatically function as a request, an advice, or an incitation. We come back to these pragmatic aspects of macrostructures in Chapter 5.

Some observations on the operation of macrorules for this text are in order. First of all, we see that macropropositions are formed on the basis of several microstructural propositions: M 1 from (1, 2), M4 from (4,5), M5 from (6,7), M8 from (10, 11, 12,13), M9 from (14,15,16,17). The CONSTRUCTION rule in those cases reduces normal components or properties to the more embracing concept, given conventional knowledge of such a concept. In some cases this constructive reduction would be difficult to make explicit, however. In Sentences 10-13 we intuitively know that one FACT is spelled out (viz., that of direct language learning) but we need specific knowledge to know what the normal properties of this kind of language learning are.

Observe also that the first sentence, in actual understanding, might give rise to the theme of learning language in childhood. However, the rest of the text merely uses this as a precondition for the comparison with 'natural' language learning methods, hence the possibility to delete the detailed information of the first sentences and to keep only the concept of 'early language learning.'

Sentences 10 and 20 refer to or address 'business executives.' As such, this information may be deleted or generalized, since at a more global level the assertions hold for anyone who wants to learn a foreign language. The more specific address, however, is determined by the context of this advertisement, viz., the specific class of readers (businessmen) of *The Economist*.

Note that the global meaning of this text, as in the case for advertisements in general, does not contain the crucial macroproposition of advertising

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communication viz., USE *X*. Instead, only the conditions for such a *practical conclusion* are spelled out: The Berlitz method is the best, because it is a natural method to learn a foreign language; The Berlitz method is good for your career, etc. The incompleteness or indirectness of the global meaning is also typical for requests and advice in general: The hearer/reader is expected to draw the (macro-)conclusion for himself.

Characteristic of this kind of discourse are also the more general *affective* macropropositions that might be derived and that are intended to bring about (positive) evaluations of the product or service that is advertised. The appeal to status (viz., business career) is explicit. Implicit is the general emotional appeal that may be derived from such notions as 'lessons from mother' both in 2 and 10, and the picture (from a photo album) of a young child which illustrates the advertisement. We could derive a proposition 'what we learned from our mother is good' and could generalize sentence 10 in a similar way for the Berlitz method. The same holds for the general evaluation of 'natural' things, which is very general in advertising. In other words, at a rather high level of generalization our cognitive set, and especially our values and attitudes, may select or produce evaluative macropropositions.

2.5.7.   At the end of this section with some sample analyses of various types of discourse we should make some more general conclusions and see in which respect our earlier formulation of the macrorules should be made more adequate. In Section 2.8 we then attempt to give a more formal account of the semantic structures and mappings involved.

First of all, ¡t should be stressed that although we have formulated and applied a number of semiexplicit macrorules, their application is still *partly intuitive*. A strict1y algorithmic application is still impossible, first because of the lack of explicit knowledge, belief, attitude or interest systems involved in the application of the rules, and second because of the informal or semiformal representation of the semantic representation of the text itself. A more or less explicit notation, as we have indicated earlier, would occupy many pages of this book just for one text fragment, if such an explicit formal representation could be given at all at the moment. Hence, in this stage of our research many problems remain which cannot be resolved at the moment and which are tasks for future investigations.

The second general conclusion is that the macrorules formulated and illustrated in the previous sections operate fairly well for a number of *different discourse types*. We have seen that specific superstructures (conventional schemata) may influence macrostructure formation, and we study this interaction in more detail in Chapter 3. The differences involved at the semantic level pertain to variable importance or relevance of actions, events, ideas, or objects in such discourse types as stories, newspaper news, scientific papers, or advertisements.

The *basic principles*, however, are the same for these various semantic structures. In stories we find detailed descriptions of the mental or other conditions, components, or consequences of actions and the participants involved in them: We try to construct a global action and global personalities. In news texts we construct a global event (natural event, action by important people), its global cause or condition, and the social or economical consequences of such an event. In the expository text (e.g., of a scientific paper) we try to isolate or construct the general thesis or hypothesis of a passage, by constructing global conditions or premises and a global conclusion. Something similar, but with a more practical aspect involved, occurs in advertising discourse, where a sequence of properties of an object or service may be taken together as a general (evaluative) assertion that is the premise of an (implicit) practical conclusion. Basic, then, is the general principle that all kinds of *irrelevant details may be deleted* where the irrelevancy is defined in terms of relative interpretation: A proposition is (globally) irrelevant if it does not determine the interpretation of other propositions in the discourse (except, possibly, for other local propositions). The second principle specifies that we may generalize over all kinds of more specific details that may be subsumed under a more general concept. The third principle allows us to construct global concepts and propositions on the basis of sequences of details that constitute the normal condition components, or properties and consequences of such a general concept proposition. Clearly, what is 'normal' in such cases depends on the culture; the social context; our expectations, values, and attitudes; and (above all) o knowledge and beliefs. All these principles appear to hold for the macroanalysis of the various texts considered above. Nevertheless we have found a number of additional properties of macrorules.

First of all, especially in the story, it appeared that macrorules do merely yield atomic macropropositions but at the same time a sequence FACTS. Besides the usual global construction of an action of event, we h the construction of the (global) personalities of the participants as well as general setting. Later we discuss the cognitive necessity of this kind propositional organization. We may only note here that in our examples t resulting macropropositions are often rather complex and. should considered to represent MACROFACTS.

Second, we have observed that the generalization or the construction operations also allow us to obtain an *interpretation* or an *evaluation*. We may take certain actions as 'typical' instantiations of a certain state of mind or personality or as the consequences of certain mental states.

Third, it has become clear that the pervasive influence of various kinds of frames (or scripts) is most obvious in the construction of macropropositions and MACROFACTS. The *social frames* especially provide information about the normal (global) actions of participants and their motivations, needs, plans, purposes/goals, etc.

Fourth, we have made some further provisional conclusions about the *ordering* of macrorules. Apparently, weak DELETION operates first followed by GENERALIZATION and then CONSTRUCTION, after which strong DELETION may be applied. It is difficult, however, to say whether this order ho1ds for all kinds of discourse, and further research on this point is necessary.

Finally, we have seen that the macrorules indeed seem to satisfy the intuitive requirements we have formulated earlier: They *reduce* a sequence of propositions to a smaller number of propositions; they *organize* a sequence of propositions by assigning a macroproposition to subsequences of them; they yield a macrostructure that may be considered as the *global meaning or topic* of the text on which they operate and thereby at the same time define what is most *important* or most *relevant* for each (sub-)sequence; and they *construct* new concepts and propositions (FACTS) from lower-level constituents.

2.6. FORMAL PROPERTIES OF MACRORULES

2.6.1.   In the previous sections we have formulated a number of so-called macrorules. It has been shown that such rules relate sequences of propositions of a text with sequences of macropropositions, thereby reducing and organizing the information of the text. Before we proceed with the further linguistic aspects of macrostructures in discourse, we should briefly discuss the *formal* basis of the macrorules however. What kind of rules are they? How can they be explicitly defined?

Recall first that macrorules are not like any kind of existing *grammatical* rules; that is, they are not like syntactic formation rules, contrary to the superstructural rules that form schemata that are discussed in Chapter 3. Nor are they like syntactic transformation rules as they are proposed in generative-transformational grammars: They do not map syntactic structures on syntactic structures. Finally, they are not interpretation rules, in the strict sense, because they do not assign meanings or referents to expressions.

The same holds for the usual *logical* rules: Macrorules are not like syntactic formation rules of a formal language or formal interpretation rules. However, there is some resemblance with formal *derivation rules* and their more or less intuitive counterparts, viz., *rules of (plausible) inference*.[13] Let us try to specify this resemblance in more explicit terms, for which a brief discussion of some logical notions must be given first.

Formal derivation rules link formulas with formulas - for example, ***a and b*** (**en letras griegas**)-and we say in such a case that *a implies b* or that *b* may be (formally) inferred from *a*. Well-known examples are Detachment, which allows us to infer *p* from *p & q*, and Modus Ponens, which allows us to infer *q* from *pDq*

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[13] For philosophical and logical analyses of this kind of inferences made by plausible reasoning, see Rescher (1976b).

and *p*. In other words, if some formula *a* is a theorem of a logical system, and if *b* may be inferred from *a*, then *b* is also a theorem of the system.

This syntactic formulation of derivation rules is usually given a *semantic* basis, by saying that if *a implies b* (or if *b* is derivable from *a*), the proposition expressed by *a entails* the proposition expressed by *b*. This means that if *a* is true, *b* is (necessarily) also true. Hence, syntactic derivation rules have a 'truth-preserving' nature.

We see that (semantic) entailment is a relation, or an operation, between semantic units (e.g., propositions). It has been pointed out, however, in recent developments in logic[14] that entailment cannot simply be related in this way with syntactic derivation, because the intuitive idea of entailment seems to involve not only a truth-preserving relation but at the same time a meaning relation. The syntactic derivation rules, for instance, allow us to derive *any* formula from a contradiction and, in general, are not at all constrained by meaning relations between the formulas. If we say that the proposition 'John is not married' or 'John has no wife' is entailed by 'John is a bachelor', we not only want to state that the last propositions truth entails the truth of the former propositions but also that their meaning is somehow 'contained' in the meaning of the latter proposition. Since there is a close link between relations of inference and (conditional) *connectives*, the same remarks are important for the account of intensional connectives as they occur in natural language: 'If John is a bachelor, he is not married' is an analytic statement due to the meanings of the words ('not married' and 'bachelor^) in the respective propositions connected by *'if... (then)'*. Both for the intensional connectives and for entailment relations, thus, it is required that the formulas be intensionally connected or, in other words, 'relevant' to each other.[15] This requirement has led to various kinds of *relevant logics* and *entailment logics*, of which we cannot give further details here. In the beginning of this chapter we have briefly specified what kind of connection conditions play a role between sentences in texts of natural language.

Both syntactic derivation and semantic entailment are linked with the notion of *necessity,* which is a modal notion. The semantics of necessity is usually given in terms of models in which the notion of *possible world*

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[14] For a discussion of this notion of entailment and the problems both in logic and linguistics involved in its formalization, see Anderson and Belnap (1975), Leblanc (1973), and the applications in van Dijk (1974, 1977a, d). A sound definition of entailment is very important for any serious semantics of discourse, because it lies at the basis of an analysis of presupposition and constitutes the formal background for any inference-making process, which also makes it indispensable for a formal model of cognitive processing. We see in Chapter 6, though, that weaker forms of semantic inference are involved in actual processing.

[15] Note that in the notion of 'relevance' here is not the same as that used elsewhere in this book, where it does not simply denote any kind of connection but rather the thematic importance of propositions. For discussions about 'relevance logics,' see the references given in footnote 14.

appears, such that truth of a proposition with a necessity operator may be specified for *all* possible worlds (as they are linked with or accessible from some other possible world). The details of this modal semantics are irrelevant here. It is only important that the connectives and relations involved also have this 'necessary' character in logic: A conclusion necessarily follows from its premises in a derivation.

In other kinds of inference, however, especially those used in natural language and natural argumentation, such logical or necessary relations need not hold. In the same way as we seldom state tautologies, we hardly ever make arguments where the conclusion follows necessarily (e.g., on the basis of the meanings of the words). Rather, we make inferences that are based on all kinds of practical or plausible reasonings: Given a number of propositions as premises, we infer a conclusion that follows more or less *probably*: 'John is ill, so he wont come', 'John's lights are on, so he is at home.' The probability of the concluding relation (expressed by the connective *so*) is based on general knowledge implications with varying degrees of 'strictness,' between social plausibility on the one hand and physical laws on the other hand. These general implications are usually left implicit in everyday arguments, because they are supposed by the speaker to be known to the hearer.

2.6.2. After this brief excursion into logic we may come back to the nature of our macrorules. We had observed that they are semantic and that they link semantic units (viz., propositions). Formally speaking, they are *mappings* because they link *n*-tuples of propositions with propositions. We might therefore speak of *semantic transformations* of some kind. Unlike definitions, however, they do not transform sentences into different sentences with the same meaning (translations, paraphrases) but specify a set of possible inferences from sequences of propositions and therefore are very much like the entailment relations mentioned previously. We have seen earlier that the semantic transformation involved *reduce* and *organize* information. This 'reductional' nature is also present in inference rules: The various possible conclusions of a sequence are 'contained in' the premises. Thus, if we say that '*p & q*' entails *q*, we have gone to a conclusion which consists of a statement which is contained in the given premise.

To see that at least some macrorules must be based on entailment, we may first look at the DELETION rules. Here, we delete one or more propositions from a sequence of propositions. If the deleted propositions, as specified, do not affect the truth (or satisfaction) of the other propositions of the sequence, we may say that the resulting macroproposition is entailed by the microstructural sequence (where '=>' denotes entailment):

(22) $(P_i, P_{i+1}, \dots, P_k) \Rightarrow P_{i+j}$

In other words, a proposition Pi+j is normally entailed which it is an element. For the macrorule of DELETION this means that a macroproposition, or topic, formed by this rule is entailed by the text it is derived from, as we may see from the first sentence of our first text example (the crime story):

(23) (**KH** saw a blonde. She was wearing a white summer frock…)
       DEL
       => **KH** saw a blonde

where the first sequence entails the second: In each possible world where the first sequence is true, the second is also true. Note that this is possible only if the deleted propositions do not change the truth value or the interpretation of the remaining propositions, as in a variation of (23):

(23) (John thought of a blonde. She was wearing ...)

In that case, we may not simply infer the second proposition because its interpretation depends on that of the first proposition: The blonde only exists (as far as we know from the example text) in a world accessible from a world in which John is thinking or, in short: 'in John's thoughts.' So, if we would try to map a story of John's dream on a macrostructural level, we would also have to specify that John dreamt the story, whereby the resulting macropropositions can be properly interpreted in a specific possible world.

We now have to see whether the GENERALIZATION rule is based on entailment. Generalization involves the construction of a predicate defining a superordinate set: We derive a proposition with the concept of 'pet' from a sequence of propositions with concepts like 'cat,' 'dog,' or 'canary.' In that case the entailment obviously holds, because the superconcept is by definition entailed by each of its subconcepts: 'for every x: if x is a cat, then x is a pet,' which is a meaning postulate of the language. So, if of a sequence of propositions (Pi, Pi+1, … ,Pk) each proposition Pi+j entails a proposition q, then the sequence as a whole also entails q. The condition again is that the other propositions do not change the concept involved. In natural language examples, the application of GENERALIZATION often involves slight modifications, such as making collective groups from individuals or making plurals. We shall not go into the formal difficulties that may arise here but simply suppose that the entailment relation is not affected by this kind of (re-) construction of a macroproposition. In our example, given our knowledge of the world (saying that 'a blonde' will usually denote a female blonde an 'tall, slim blonde' is a particular instantiation of 'pretty'-in a certain value system), we may conclude that the following indeed holds:

(24) (John saw a tall slim blonde. ..)
     GEN
     =>   John saw a pretty girl

The same may be said for the generalization of the concepts of 'caught his eye,' 'looked,' 'studied,' 'watched' in the same passage, which may be generalized to 'looked at.'

Theoretical difficulties arise however as soon as we go to types of generalization that already have a more *constructive* nature. We have seen that in the GENERALIZATION rule we collect a number of concepts under a superconcept (if any) and that hence each proposition of the microstructure in such cases must entail the macroproposition. In other cases, however, we are not sure whether the detail information of the microstructure should be regarded as particular instances (members, subsets, etc.) of a superset or as *constituent properties* of a superconcept. In our passage from the crime story, for instance, we have expressions that denote various mental acts of the participant. These acts may be taken together under the more general concept of 'guilt feelings' or 'bad conscience.' If *each* of these acts would entail the more embracing concept, the interpretative generalization would indeed also be based on entailment. If, however, only the *joint* presence of the acts defines the other concept, we have an example of construction.

The same holds for *evaluative* generalizations. lf from the same sequence of acts we take *each* act as an instance of morally unacceptable behavior (as **KH** seems to do himself), the evaluative statement would be entailed by the sequence by generalization (viz., on the basis of some value system assigning general values to certain classes of actions). If, however, only the *joint* sequence entails such an evaluation, we must first find a constructed concept.

2.6.3.   We have demonstrated that both DELETION and GENERALIZATION essentially respect the semantic relation of entailment and that hence the macrostructure thus produced is entailed by its microstructure. What about CONSTRUCTION?

In Order to demonstrate that CONSTRUCTION *in principle* also respects entailment, let us give a well-known example. lf we have a sequence like:

(25) (John went to the station. He bought a ticket. He walked to the platform and boarded the waiting train. After a few minutes the train departed ...)

we are able to derive the macroproposition 'John made a trip with the train to…' This is possible because we have conventional knowledge about episodes like traveling by train. This knowledge as we have seen before is

cognitively organized in *frames or scripts*. In a formal semantic theory, this knowledge that is necessary to connect sentences and to derive macropropositions is simply taken as a set of propositions. Part of this knowledge is normally represented in the lexicon of a language. In general we may say that certain concepts may be defined in terms of sets of other propositions, much in the same way as we may 'define' the concept of 'bachelor' with concepts like 'human,' 'male,' 'adult,' and 'nonmarried.' Such concepts may be called *constitutive*: They must each and jointly be present in order to define the more complex concept. The concept of 'train travel' is similarly 'defined' in terms of other concepts, but since a global action is involved, we specify the concept by a sequence of propositions denoting the respective constitutive conditions, events, and actions that are each and jointly (culturally or conventionally) 'necessary' in order to form the instantiation of the global action concept.

Now, in our example we see that the sequence of propositions as expressed by (25) denotes the episode that is conventionally known and represented as the concept of 'train travel.' It follows that if the sequence features *all* the t necessary propositions that make up the concept of train travel in our knowledge set, the sequence properly *entails* the global concept:

(26) $(P_i, P_{i+1}, - - - , P_k) => q$

The difference with GENERALIZATION is that in (26) only the *joint* sequence entails q and not each proposition of the sequence. The entailment relation holds trivially because there is an *equivalence* relation between the sequence and the global concept in the knowledge set (or the lexicon). This means that the entailment arrow in (26) may also be turned to the left: Given the global concept, ideally we can specify what the necessary propositions in the sequence are. It follows that the CONSTRUCTION rule, in this formal sense, also respects entailment. Since we now have demonstrated that each of the macrorules is based on entailment, we have, by induction, demonstrated that, formally speaking, *each macrostructure is entailed by its underlying microstructure.* In more intuitive terms this means that a topic or theme of a text is 'contained' in the text, because it may be semantically derived (inferred) by it.

Note that a textual sequence need not *only* have the constitutive propositions of a global concept. In (25) for instance we may add all kinds of propositions about what else John did in the station (buy a newspaper, see a friend) or in the train (read a newspaper, speak with somebody) For the formal theory, it is only important that in a sequence *at least* all the constitutive propositions are present.

2.6.4.   There are some difficulties in the formal analysis of macrorules that should be mentioned. It has been assumed that the text itself expresses all the

information necessary for the rules to apply. We have seen earlier, however, that this is actually never the case and that texts are usually *incomplete*. In such cases propositions must be taken from knowledge or other components of the cognitive set. This means that the entailment proof given for the macrorules, and especially for CONSTRUCTION, should be specified relative to a set of propositions *C*, being the cognitive set of the language user. In an abstract semantic theory it does not matter whether in comprehension all component propositions of a knowledge frame or script are actualized or not in the formation of a macroproposition. In fact, for the establishment of linear (local) coherence we assumed that this need not even be the case in abstract semantics: Only the propositions that are interpretation conditions for later propositions must be interpolated in the explicit text base. In the entailment proof for CONSTRUCTION, however, all necessary component propositions of a global concept must be specified.

However, a shortcut is possible that does not have this strict condition. Since we need not have equivalence (which is both ways) but only entailment (one way, viz., microstructure entails macrostructure), it is sufficient when one or two *crucial* features of a global concept are present in the text base. In that case the crucial propositions alone entail the global concept (e.g., 'going to the station, 'getting into the train,' and 'the train leaving' are crucial to infer the global proposition of making a trip by train). All other frame or script information need not be present in that case for the CONSTRUCTION rule to operate. We see later that this account is closer to the strategies actually used in global discourse comprehension, and these seem to be more or less probabilistic (inductive). It is clear however that as soon as natural language and knowledge are involved, the boundaries between (necessary) entailment and (probabilistic) practical inference are not very clear-cut.

Incomplete text bases as such may be *ambiguous* at the macrolevel; that is, their propositions may induce actualization of various possible frames and hence of several macropropositions. In general, however, previous or following (macro-)propositions disambiguate such sequences, which shows, as we have seen before, that macrorules should apply in a relative way, taking into account all the information of the text. In other cases (e.g., in evaluative generalization), ambiguity is possible, and even normal when values and beliefs are different. In our example of the crime story we have seen that different global interpretations with respect to the character of Ken Holland can be constructed. In actual processing this ambiguity of the text (or perhaps we should say the 'indeterminacy' of the text) normally gives rise to *alternative* global interpretations by different language users.

2.6.5.   Let us finally try to reformulate the various macrorules and their conditions in a more precise way. We have indicated earlier that such a formulation can at most be semiformal because we lack a sufficiently complete and explicit semantics for natural language. In Section 2.7 we

further investigate some of the properties of the macrostructures themselves. These properties are at the same time further conditions on the application of the macrorules. It should be recalled that the macrorules are abstract semantic mapping or inference rules and not cognitive rules or strategies. They do not take into account the various cognitive factors that influence the operation of macrorules in discourse comprehension but merely define the linguistic-semantic notion of a 'global meaning' or 'topic' of a discourse. We see later what the cognitive correlates of the rules are and how they may he applied variably depending on discourse type (see Chapter 3) or context.

Let us begin with the DELETION rules. The *general* definition for the macrorule of DELETION may be as follows:

(27)   DELETION
       Given a sequence E of propositions (Pi, Pi+1, …, Pk) of a text T, satisfying the normal linear coherence constraints, substitute E by a sequence E' such that each Pi+je E that is not an interpretation condition (presupposition) for at least one proposition of T does not occur in E', whereas E and E' are further identical.

This definition pertains to what we earlier provisionally called WEAK DELETION. The deletion of locally relevant information by the STRONG DELETION rule can be obtained by the application of a DELETION rule at higher levels; that is, as soon as later propositions in the text are themselves deleted, their specific presuppositions may be deleted. Further constraints on the macrostructure output of the rules are discussed in Section 2.7.

It should be recalled that the rules in principle operate on *atomic propositions*: In complex sentences we may only delete those propositions that are no longer relevant but not the others. Clearly, if these atomic propositions, as expressed by a sentence or clause, are organized in FACTS and if a whole FACT is irrelevant, this whole FACT may be deleted at once because the rule operates on sequences of propositions.

In our earlier examples we have seen that some proposition itself is no longer relevant for the interpretation of the rest of the text but that some more general implication (e.g., about the personality of a participant) should be represented at a more global level. Such cases, however, should be handled by a variant of the rule of GENERALIZATION that we may now define as follows:

(28) GENERALIZATION
       Given a sequence E of propositions (Pi, Pi+1, … , Pk) of a text T, satisfying the normal linear coherence constraints, substitute E by a proposition q such that each proposition Pi+je entails q and q is the smallest possible generalization of E.

It is much more difficult to give a precise formulation of the kinds of generalization that we have called *interpretation* and *evaluation*. Thus, if q in (28) is denoting a global action, we may further interpret q by assigning it a proposition r such that r denotes a general motivation, condition, or characteristic of the agent. If r in that case is a value statement, we have what we have called an evaluation. If on the contrary only the joint set of propositions entails an interpretation or evaluation, we have rather a variant of the CONSTRUCTION rule, which we may formulate as follows:

(29) CONSTRUCTION
> Given a sequence E of propositions (Pi, Pi+1, … , Pk) of a text T, satisfying the normal linear coherence constraints, substitute E by a proposition q such that q entails the joint sequence E, given a set C.

This brief formulation is derived from our earlier discussion in which it was shown that the constructed macroproposition is equivalent to the joint sequence of propositions of the text. This means, for instance, that E and q denote the same fact but at different *levels of representation* (a notion we discuss later). The set C here is the cognitive set, containing subsets of knowledge, beliefs, interests, tasks, etc., to be accounted for theoretically in a cognitive theory (Chapter 6).

Both for (28) and (29) we need further constraints. Thus, in (28) it makes sense to generalize only, within a macrostructural perspective, if the input sequence contains more than one proposition. If we would want to generalize from one proposition, we could not speak about the smallest possible generalization (defining the immediate superset of the concepts involved), because it would be the proposition itse1f. Similarly, in (29) the sequence may not consist of just one proposition, because in that case the rule would hold trivially for any proposition (being equivalent with itself). Hence, both in (28) and in (29), $k > i$. Only in that case do the macrorules satisfy the general requirement of reduction and organization.

Another important addition pertains to the nature of the input sequences: These need not be *continuous.* In other words, the propositions need not be expressed by clauses or sentences following each other in the text. The propositions of the sequence may be expressed at different places in the text Thus, the construction of a general personality feature of an agent may be based on many propositions through the whole story.

2.7. PROPERTIES OF MACROSTRUCTURES

2.7.1.   In Chapter 1 and the earlier sections of this chapter we have surveyed a number of more or less intuitive properties of macrostructures. Having formulated the macrorules that generate macrostructures from micro-

structures, we now specify further the constraints on theoretically constructed macrostructures themselves.

First of all it should be recalled that we cannot properly speak about 'the' macrostructure of a text. Since macrorules are *recursive*, viz., apply on *any* sequence of propositions (including macropropositions) that satisfy the conditions of the respective rules, we may have several *levels* of macrostructures. The highest level contains the macropropositions representing the text as a whole that cannot be further reduced by macrorules. The lowest level in general holds for short sequences of sentences (e.g., those of one paragraph). For very long texts (e.g., novels or textbooks), the number of levels may be rather highly. Finally, for very short texts (e g., those consisting of one or two sentences), the macrostructure may be identical with the microstructure (by application of a ZERO rule). It is shown in Section 2.8 hat level differences may also exist in the text itself, e.g., in connection with different degrees of *completeness* of representation.

2.7.2.   Each macrostructural level consists of a sequence of propositions. Such a sequence must itself be *linearly* and *globally coherent*. Global coherence may be established by mapping on a higher-order macrostructure. Linear coherence must satisfy the various relations between propositions discussed in the beginning of this chapter. Roughly speaking this means that the respective (global) facts denoted by the macropropositions must be related, e.g., by various conditional relationships. It also means that the macrostructure of each level must be *explicit*: Each proposition that is an interpretation condition for another proposition must be part of the macrostructural sequence of that level. Of course, if we want to express such a macrostructure, e.g., in a *summary*, many of those propositions need not be expressed, just as this is the case for any discourse, given the usual pragmatic constraints on discourse production and communication.

From this discussion it is clear that macropropositions are not a particular *kind* of proposition: They are propositions, but propositions obtained by macrorules from other propositions. They also represent part of the *meaning* of a text, but not the meaning of its individual sentences but the *global meaning* of sequences of sentences. As in any kind of meaning in a serious semantics it is specified. in terms of the meanings of constituents, in this case the meanings of sentences and by rules such as the macrorules. One could argue that the meaning of sequences of sentences is a complex kind of meaning consisting of some connected sequence of propositions, and this is certainly correct. It is this level of meaning that we have called microstructural. In a somewhat similar way as the syntactic and semantic structures of sentences cannot simply be given in terms of the constituent words alone but require more global syntactic and semantic categories, we can say that the complex meaning structures of sequences may be further

organized by more global semantic categories. We therefore are entitled to describe meanings of complex utterances at several levels. To use another grammatical comparison, given the syntactic structures of words and phrases, we not only have 'higher' categories but at the same time need to specify the syntactic (and the semantic)*functions* of these units, functions that can only be specified with respect to the structure of the sentence as a whole. Now, at the textual level, we can only specify what the function of a given sentence meaning is when we are able to specify the meaning of the sequence as a whole. Given a description of the episode of somebody taking a plane to some other town, we must be able to represent this 'whole' meaning, given the meanings of the respective sentences of the story, *even if the meaning as a whole is not expressed*, at least not directly. That it is relevant to assign this kind of meanings in a *linguistic* semantics is shown in Section 2. 10. In other words, we do not want to reserve macrostructures for a cognitive theory by merely considering them as *inferences* that may (variably) be made on the basis of the 'real' meaning of the text.

2.7.3.   Macrostructures not only are the explicit representation of the global meaning of the text but also give at least a partial explanation of such notions as *importance, relevance, or prominence.*[16] Again, these notations can be given a more or less formal, linguistic treatment (viz., in terms of the notions of 'theme' or 'topic' as they are made explicit by macrostructures), but they also need treatment in cognitive terms. Clearly, a notion like importance, applied to information of a text, is relative to the cognitive set of language users. The semantic analysis of importance can be given both in terms of microstructures and of macrostructures.[17] Thus, we may specify which words (concepts), clauses, or sentences are important 'in' the text, that is, as expressed by the text, but we may also specify what is important of whole fragments or of the text as a whole. In that case, we specify the 'upshot' of the text, in terms of macrostructures. We therefore claim that for each passage the macrorules define what is globally the most important information conveyed by that passage.

   Both at the microlevel and the macrolevel, however, a different notion of importance may play a role, a notion we may indeed call *prominence* and in which *differential* or *contrastive* importance is involved. In Chapter 6 for instance we see that in a sequence of sentences it may well be the case that some concept or proposition that, *structurally*, is merely a rather unimportant detail nevertheless may be prominent or salient for other

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[16] The notion of 'prominence' in discourse has been used to define 'themes' by Kay Jones (1977).

[17] Different kinds of relevance assignment both at the micro- and the macrolevel are discussed in van Dijk (1978c).

reasons (e.g., relative to personal memories or associations of language users or, in general, their values, attitudes, or interests).

In a semantic theory we can only specify the more 'objective' aspects of this kind of prominence (e.g., in terms of linear coherence and 'breaks' of such coherence or in terms of intensional relations of contrast between meanings, words and sentences).

The same may hold at the macrolevel. Once a sequence of macrolevel propositions is obtained, it may be the case that one of the macropropositions, or even one concept of one or more of the macropropositions, is more prominent than the others. This kind of global semantic prominence may be based on different criteria. On the one hand it may pertain to the concept (e.g., a participant, occurring in several macropropositions); on the other hand it may be a concept that can be intensionally contrasted with other concepts in the macropropositions (e.g., 'defeat' in a 'success' story). Finally it may be the 'dominant' or 'superordinate' proposition denoting the most important event, of which the other macropropositions are the conditions, background, or consequences. In the last case we again observe the kind of importance defined by the macrorules.

2.7.4.   It is argued in Chapter 1 that semantic information is not only organized in propositions but that also introduced in a more complex mode of propositional organization, in terms of FACTS. Although there is no formal semantic theory of FACTS, so that one might want to relegate such a notion to cognitive semantics (e.g., in order to account for the organization of propositions in comprehension), we provisionally also use the term FACT to denote a semantic organization unit.

Since a macrostructure is also a sequence of propositions, we may assume that macrostructures are organized as FACTS. In the examples we have analyzed earlier in this chapter, we have seen that the resulting information indeed can be organized in FACTS, which can be expressed by (complex) sentences: '**KH** looks at a pretty girl in the street,' 'The Supreme Court ruled that race may be a consideration in university admission schemes,' 'The Berlitz method is the best language tuition system in the world,' etc. Instead of simply adding global atomic propositions, such as 'There is an x such that $x =$ **KH**' or '**KH** looks at y,' a FACT allows us to specify in a simple way the various functions of the global concepts derived from the text. We see later how important FACTS are for any cognitive task, including discourse comprehension.

Here, however, we should ask ourselves further why the macrorules have been defined for propositions and not for FACTS. If propositions are organized in FACTS, both at the micro- and the macrolevels, why not directly map FACTS onto FACTS? And indeed, we have also seen that for the CONSTRUCTION rule the microstructural components seem to be the

respective FACTS as they also occur as elements of knowledge frames and that the result is also a global FACT. The problem however is that very often the input and the output information of the macrorules are not FACT-like at all. lf for instance we 'amalgamate' the various modifiers of a participant in a story, by generalizing or constructing toward a more global modifier, we do not have complex FACTS but propositions as input and output, even if these propositions, as such, will again be organized in FACTS at both levels. That the girl in our crime story is called 'pretty' at the global level is a result of abstracting from the atomic propositions '*a* is blonde,' '*a* is tall,' '*a* is slim,' etc., and not because it is explicitly stated as a FACT that the girl was beautiful, a FACT that by ZERO can be taken up in the macrostructure because of its relevance.

There is another reason why it would be difficult to go directly from FACTS to FACTS (except perhaps in ZERO). Participants at the microlevel may have various semantic functions. Hence, even the 'hero' of a story will at that level often be 'Object' or 'Patient' or 'Beneficiary' and not only 'Agent.' In the corresponding macropropositions of such a passage, however, the same hero may well appear only as the Agent of the global FACT formed by these macropropositions. This means that the global roles of the respective participants must be constructed separately. This is possible only after having globally constructed the macroaction involved, after which the participants can be inserted into the respective FACT-categories. So, we cannot simply look at the structure of the sentences of a text and then decide when in all (or most) of the cases a participant has the Agent role, it will also have the Agent role at the global level. Of course, this will often be the case and therefore may be an expedient cognitive strategy in discourse comprehension. Formally, however, this is not necessary at all, because the role structure depends on the nature of the global predicate constructed, as may be clear from the following two examples:

(30) (a) **KH** looked at pretty girls in the street.
      (b) Pretty girls in the street frustrated **KH**.

Here **KH** appears in different roles at the macrolevel, and for each MACROFACT there are different roles for **KH** in the sentences of our example text.

2.7.5.   It has been assumed that notions like 'theme' or 'topic' are to be made explicit in terms of propositions and that these propositions may further be organized into MACROFACTS. There is a notion of *theme* however which is not propositional but which is based on single concepts. Thus, both in literary scholarship and everyday discourse we often speak, intuitively, about themes of texts, such as 'death,' 'drugs,' 'crime,' or 'love.' In that case we mean that

such texts are *about* such concepts, whatever the specific macropropositional content of the text. One way of explaining this notion is to take it as a fragment of one or more macropropositions of a text (e.g., as the 'main participant' or the participant occurring in several macropropositions). Sometimes terms for this notion of theme may also be nominalizations for main events or actions of the MACROFACTS.

Themes of this kind are usually not arbitrary parts of macropropositions but involve concepts which are *socially important* and which hence are recurrent in many discourses of a certain culture or discourses of the same author (e.g., in literature). Thus, we have a theme like 'death' or 'terrorism' rather than a theme like 'paperclip' or 'book page,' although there may be many themes people speak about or write articles and books about (plants, dogs, cancer, travel, airplanes, etc.). Yet, there are socially important themes that may be called 'life themes' (of a certain culture) because they may underlie the basic motivations, goals, and interactions of people.[18] We come back to this kind of theme in Chapters 4 and 6.

2.7.6.   Macrostructures, first of all, were shown to *organize* as a sequence of MACROFACTS, which collect sequences of macropropositions according to their semantic functions. There are also other ways of organizing both macropropositions and MACROFACTS.

In the first place, it is possible to assign *functional relations* to sequences of propositions or FACTS, according to a number of *categories* that traditionally studied in rhetorics. This kind of analysis is practically unknown, in linguistics but is very relevant for the description of discourse.[19] In Chapter 3 we see that, given a sequence of propositions or sentences, we may say for instance that some proposition/sentence *A* is an *explanation* of a proposition/ sentence *B*. Similarly, we may say that B gives an *explication* or *specification* of *A*. Conditional relations may be assigned the function of *preparation* or *presupposition /precondition*. Propositions may, similarly, actualize a relation of *contrast, confirmation, illustration, or compari*son. Such functional relations also hold at the macrolevel. In the Berlitz text, for instance, there was a relation of comparison between the macropropositions 'You learned a language easily when you were young' and 'You can learn a language easily by the natural methods of Berlitz.' At the moment there is no

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[18] The importance of the latter notion of (life) theme has been recognized by Schank and Abelson (1977), where it is defined in terms of major motivations and goals of persons or represented persons in stories.

[19] This kind of functional or rhetorical relation between sentences or propositions has been given attention by Grimes (1975), who however does not merely distinguish among semantic, pragmatic, and stylistic/ rhetorical functional relations. In psychology, Meyer (1975) has used the categories of Grimes in memory experiments.

serious theory of such functional or 'rethorical' relations, however, and we do not attempt to provide one here.

Interesting, however, is the fact that some of these functional relations may be conventionalized (e.g., 'premises' and 'conclusion'). We study these as *superstructures* in Chapter 3.

2.7.7.   The discussion about macrostructures until now has been focusing on the meaning aspects of their semantic analysis: A topic or theme, taken as (parts of) macropropositions, is considered as an aspect of the 'global meaning' of texts. However, a semantic analysis also should deal with the issue of *reference* or *denotation*. Propositions are in principle objects that may be true or false or satisfied or nonsatisfied in some possible world. We have assumed that it makes sense to introduce the semantic type of *fact*, being the denotatum of a proposition (or of a sentence expressing such a proposition) for some possible world. Such a fact is a *structure* of an event, action, process, or state in which several participants with various roles are involved, as we have specified for the complex semantic notion of FACT. In other words, we should rather say that a fact is the denotatum of a FACT.

The problem now is what the denotatum or referent is of a macroproposition or a MACROFACT. Intuitively we might say that such a denotatum is a certain unit combined from other facts. Although this may often indeed be the case, such an assumption could be misleading. Recall that we have stressed that macropropositions, as such, are not different from (micro-)propositions: They are only defined with respect to sequences of micropropositions. Only the importance or relevance of a proposition relative to a text makes it a macroproposition. Sometimes, then, the same macroproposition may function at various levels. In other words, the 'world' itself does not change by the importance we assign to certain of its facts or by the level of detail we describe such facts. Hence macropropositions and MACROFACTS also have (simple or complex) facts as their referents. So, independent of discourse, we may distinguish between complexities of facts (e.g., actions). We might distinguish between simple or basic actions, and complex actions or even action sequences, which may be represented by one or more propositions, both at the micro- and the macrolevel of a discourse, according to their relevance for the discourse as a whole, or the cognitive understanding of such a discourse. In Chapter 4 we try to give an account of such complex facts in terms of macrostructures of action. Although the level of discourse and the world it is about are in principle independent, it is clear that notions like proposition or FACT also determine how this world is perceived, interpreted, segmented, processed, memorized, talked about, etc. In Chapter 6 we therefore have to see how FACTS and facts are cognitively related. For our semantics, thus, we need no specific notion of 'macrofact' as a referent for macrostructures, it seems.

Yet, the problem is more complex. Modern, semantics not only interprets expressions (terms, predicates, etc.) but also *structures*. We might ask whether the structures, assigned to sequences of sentences by the macrorules should not be given an interpretation. After all, a macroproposition organizes a sequence of propositions, and it may therefore be the case that this organization should also be assigned a value in some possible world. If a sequence denotes a sequence of facts, the macroproposition may be taken to refer to the *organization* of these facts or the *operation* that takes them together. Of course such an organization or operation is cognitively based but so are all the semantic objects of our ontology. Reality may perhaps be relatively independent of discourse, but as far as it is epistemologically relevant for us-it is not independent of cognition. Although we cannot pursue these philosophical issues further here, we may conclude that since reference is a notion tied to the semantics of expressions and discourses of languages, we may assign organized fact units to macropropositions and hence provisionally speak of macrofacts anyway. A macrofact, just like a macroproposition, is however not a particular kind of fact but only a particular organization of facts or rather a fact defined in relation to other facts (e.g., the facts that *constitute* it, the facts from which it is *abstracted*, or the facts among which it is *selected*, being the three operations that may be taken as the values of the macrooperations). Hence, 'John took the train to Berlin' is a macrofact only relative t o the respective facts constituting this fact. Thus, in the same discourse the sentences may also refer to various *levels* of reality, an issue we discuss in somewhat closer detail in Section 2.8.

The problem of an extensional semantics for macrostructures has been framed in terms of FACTS and facts. More classically, however, it might be asked in what respect we may assign *truth* or *satisfaction* values to whole texts or whole fragments of texts. We may of course give truth conditions for the individual sentences, and if the sentences are connected by the usual connectives, we may assign truth values that are functions of the truth values, of the component sentences. As soon as we simply have sequences, the problem is more difficult. The simplest solution in that case would be to interpret the sequence as a *conjunction*. In that case a sequence ($P1$, $P2$, …, Pn) would just he true if and only if each proposition (or sentence/ clause) of the sequence is true. However, if the sequence is ordered in more spec ways (e.g., by the assignment of macropropositions by macrorules) the truth conditions might well require more complex ingredients. That such a semantics for texts is necessary has already appeared from the earlier discussion about *entailment*: We need a sound definition of truth for joint and even further organized sequences in order to specify why a sequence of propositions may entail a proposition (which is not part of it or entailed by the individual propositions). Similarly, as we see later, we must be able to define a semantic relation between whole texts (e.g., the entailment of a summary by the text it summarizes).

Provisionally, then, we say that a text *T* is true if and, only if each of its propositions/sentences is true in a sequence of connected *models* -which means that the interpretation of each sentence is *relative* to the interpretation of the other sentences of the text -*and* if each macroproposition of *T* is true in the respective connected *macromodels*. A macromodel is constructed from the models needed to interpret the respective sentences. It would feature macroactions that are the result of operations applied to sequences of actions. A macroproposition is an abstract function (a complex concept) that for some possible world has such an operation as its value. It is in this formal sense that we can say that the proposition 'John traveled by train' at a macrolevel denotes the global action that is the operation of 'taking together' as a unit a sequence of actions in some possible world. There are of course many open problems and difficulties here, but we do not attempt to work out the full formal semantics for sequences of sentences and macrostructures of texts but leave this discussion with these few suggestions.

2.8. COMPLETENESS AND LEVELS
OF DESCRIPTION IN DISCOURSE

2.8.1.   Sequences of sentences are *interpreted* as sequences of facts. Conversely, we say that facts are *represented* by propositions, which are *expressed* by a sequence of sentences. These links between discourse and the facts that define possible worlds require some further remarks.

Clearly, any state or episode of reality is made up of a great number of facts. Yet, any discourse of natural language and communication will only represent a small number of these facts. First of all, a *complet*e representation of the facts would be empirically impossible. More important, such a complete representation would not be *relevant* from a communicative point of view: Many facts are known already by the hearer/ reader, whereas other facts need not he known or are not interesting or relevant for the hearer/reader. Hence, a discourse is strictly speaking only an *incomplete* representation of real states of affairs or episodes, at least from a formal point of view. It *selects* facts for representation, expression, and communication and at the same time expresses how, cognitively, these facts are *constructed* for some possible world.

The   incompleteness   of   discourse   representation   is   however   not *homogeneous*. Some states or episodes will be represented in more detail than others, so that the *degree of completeness* in the same text may be varying. Of course this notion is *relative*, because we have no absolute measure for complete descriptions of reality. Given a sequence with a certain degree of completeness, we may speak of subsequences which are *subcomplete* if certain facts are not represented which according to the completeness degree should have been represented, as in the following example:

(31) John took a cab to the station. He entered the hall and went to the ticket counter. He asked for a ticket to Berlin, got it, and paid for it. In the train he read a newspaper (...).

In this constructed example we would expect, given the relative completeness of action description of the first part of the fragment, that also the actions between paying at the ticket counter and reading in the train would be represented (e.g., walking to the platform, waiting for the train, the arrival of the train, boarding the train, and selecting a seat). In some cases subcompleteness is unacceptable (e.g., when sentences are left out that are necessary to establish coherence). In our example this need not be the case, given the frame-like character of the episode: In that case the missing links may be constructed by the reader/hearer.

In a similar sense we also may have *overcompleteness* if in a sequence of a certain degree of completeness we have a subsequence that specifies more facts than needed:

(32) John took a cab to the station. At the ticket counter he asked for a ticket to Berlin. The girl took the ticket and gave it to him. He took it, put it on the counter, took money from his pocket, and paid it to the girl. He greeted her and went to the train, boarded the train, and read a novel during the trip to Berlin (...).

In (32) the whole middle fragment of the sequence gives a more or less precise description of the buying-a-ticket episode, although the relative completeness of the rest of the fragment would not need such a description: A sentence like *He bought a ticket to Berlin* would have been sufficient.

Overcompleteness, as in out example, is also sometimes unacceptable, especially if there are no obvious communicative reasons to give so much detail. However, overcompleteness may also be *functional*. In that case, we should rather speak of a *shift* in the completeness degree of a sequence. For instance, as soon as a certain episode is relevant in the story (or for the speaker or hearer), we may change the completeness of the description. In crime stories for instance, moments of suspense are typically represented in this way. The same in our everyday stories: The point or complication (see Chapter 3) of a story may be given a much more extensive description, whereas the introduction or setting, mentioning the preparatory actions and the general background, can be represented with only a few sentences: *Yesterday I was in London. There I met a strange guy....* In our example of the ticket-buying episode we may have more detail if for instance John falls in love with the girl of the ticket counter. In the earlier example of the Bakke-case decision of the Supreme Court, the decision itself was described with a higher degree of completeness than some other actions, e.g., the preparatory

conditions of the decision (the various discussions of the claim of alleged discrimination by Bakke): who were for or against, or other details of the Court. Of course, in a play, novel, or film about such a decision, a much more precise description of the various (inter-)actions of the justices may be given.

2.8.2. The notion of relative completeness of representations is closely related to the notion of *level of representation*. Completeness has to do with the amount of information given for a level of representation: We may leave out representations of events of the same level if the events are well-known, for instance as parts of frames or as known contextual knowledge or if mentioning those events is irrelevant. The level of representation on the contrary is the *degree of specificity or generality* with which facts are represented. Thus, in (32) we witness a change of description level because suddenly a similar event is represented in much more detail. The link with the notion of macrostructure is obvious here: A sequence of details of representation level $r\,i$ may he represented by a macroproposition that is at the same level as other, more global representations of the same text at level $r\,i$ +1. Like relative completeness, the representation level may change for several reasons. Giving more detail about a certain fact would indicate that such a fact is more important, that components of such a fact may be conditional for the interpretation of the rest of the text, as it is for instance in detective stories, where a given detail may turn out to be a crucial condition for finding the murderer.

In our examples of a macroanalysis given earlier in this chapter we see first of all that in the crime story fragment the level of representation does not change: All the actions and events described are (roughly) of the same level, the various components of looking at somebody and the resulting mental acts associated with these actions. In the news text about the Supreme Court decision in the Bakke case, we witness a change of level: Details are given about the arguments and votes of the decision of the Court but not similar details about how the minority groups decided to protest against the decision; their arguments are merely summarized. In other words, propositions in the text about the minority reaction are at the same level as a macroproposition on the decision itself. Besides possible sociopolitical reasons, such as the point Of view of the journal and the relevance assigned to arguments of minority groups, this difference in representation level is motivated by the fact that the news text focuses on the decision of the Supreme Court. Preparatory acts, other conditions, and reactions are defined with respect to this central event. We see, as we observed earlier, that in a macrostructural representation of a text, we may well have differences of importance. Hence, the more important macroproposition is the proposition which is *semantically superordinate*, that is, which has as subordinate propositions those propositions which denote preparatory events, conditions, properties or components, consequences, or background.

Changes in the level of representation are not arbitrary, given these various functions of such changes. This means that there are also constraints that would make certain level changes unacceptable. Whereas in a court trial all kinds of details of events or actions of defendants may be discussed, it is not possible to mention the detailed actions of participants in the year report of a big business firm. In psychological reports we may have details of what subjects did during an experiment, but in the general conclusions such detail is no longer needed. In everyday conversation, it may be the case that certain events are represented at too specific a level, which may lead to reactions like *"Can you come to the point?"*. There are general communicative constraints that require, for each type of discourse, topic, and context, an approximate *upper and lower bound* for levels of representation and the relative degree completeness for each level, as well as the conditions under which level change and changes in the degree of completeness are necessary or possible. Further empirical work on discourse should make these constraints explicit. For our discussion, the links between (levels of) macrostructures and levels of representation are important.

2.9. SENTENCE TOPIC
VERSUS DISCOURSE TOPIC

2.9.1.   In this section we briefly elaborate on the distinction between the notion of theme or topic introduced for discourse and the concept of *topic* (or theme) as it is used in the description of sentences.[20] The latter notion is often linked with that of *comment.* Although there are some links between the two notions, we provisionally would like to keep them apart as different theoretical notions of linguistic theory.

The topic of a sentence is sometimes associated with a part of the sentential structure (e.g., the first noun phrase) and sometimes with a part of its underlying semantic representation. Whatever the differences in theoretical definition, the notion of topic of a sentence is usually defined in terms of *information* that is already *introduced* (in the previous part of the conversation or the discourse), already *supposed* by the speaker to be *known* to the hearer, or otherwise *given* or started from. The comment, then, expresses or 'is' the information in the sentence that gives *new, unknown, unpredictable*, etc., information in relation to the topical information. These aspects are certainly involved in the notion of sentence topic, but until now

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[20] For more details about the elusive notion of (sentence) topic; see Sgall, Hajicová, and Benesová (1973), Li (1976), and Dik (1978). For the identification of sentence topics as a function of the sequential structure of discourse, see van Dijk (1972, 1977a). The differences and links between sentence topics and discourse topics are summarized in van Dijk (1977g).

there is no satisfactory theory about topic and comment. Although we briefly want to indicate some further ingredients for a future theory, we are not claiming to solve the problem here.

2.9.2.   There are a number of fundamental properties of sentential topics that should be stated first. Although the distinction has been studied above all with respect to features of sentence structure, such as word order, special constructions (such as cleft sentence or pseudo-cleft), and stress or intonation, it should be emphasized that these should be treated as surface structure *manifestations* of sentence topic. Topic, thus, is a *semantic* or a *semantic-pragmatic* notion. Second, a topic is not merely part of the semantic structure of a sentence but rather a *function* assigned to part of the semantic representation of a sentence. In other words, that part of the semantic representation that has a certain function is called the topic or has topic function. The same obtains for the notion of comment.

Of interest to our discussion is the next general property of sentential topic, viz., its dependence on the structure of *discourse* or *conversation* or, in general, the *information context* of a sentence. Even in those studies where topic and comment are studied for isolated sentences, contextual information is always present. This appears most clearly in the fact that the usual test for topic definition in a sentence is the *previous question*. Given a question *Where did John go?* a sentence like:

(33) John went to London.

is assigned topic function for the part expressed by *John went* and comment function for the part expressed by *London*. The question of a language user *A* implies that *A* knows that John went somewhere, a knowledge item that hence must be supposed to be known by *A* by the *speaker B* of (33). It follows that the conceptual part 'John went 'is not new or unknown for *A*, whereas the part 'London' provides the unknown constant for the variable in the formula *went to (John, x).*

In general, then, it should be stressed that topic and comment functions in sentences exhibit the ways information is *distributed* in a text or conversation. In particular it indicates how the information of a sentence is tied up with contextual information. In order to extend the knowledge set of a hearer, we make assertions or accomplish other speech acts by expressing sentences and sequences of sentences. In each sentence, then, there must be new information, but at the same time ¡t must be indicated how this new information is linked to the information already present. There are, as usual in grammar, normal or canonical ways to indicate these functions. In English and many other languages this is done by word order and stress or intonation, such that usually the first noun phrase, often having the syntactic subject

function, is associated with the topic function, and the rest of the sentence with the comment function, which at the same time has more prominent, stress. Comments expressed in another 'preferred' position will usually be, assigned specific stress.

From this very general discussion we may finally draw another conclusion about the general properties of topic functions in sentences, viz., the *pragmatic* and/or *cognitive* basis of the notion. The definition or descriptions involve assumptions of language users about each other's *knowledge*. Another cognitive aspect is that of *focus of attention*. Given a number of concepts, expressed by previous text or conversation, the topic signals which of the concepts is (are) *selected* for further predication and which therefore must be *(re-)activated.* This is a result of the constraints resulting from the limited capacity of short-term (semantic) working memory, which we discuss in detail in Chapter 6. In an abstract semantics we are able to define topic and comment functions only on the basis of information distribution (e.g., in terms of concepts that define the knowledge set K, of which the concepts of previous discourse or conversation are a subset).

2.9.3. We see that theoretically the notion of sentential topic is quite different from that of *text topic.* A text topic is a (macro-)proposition derived from propositions expressed by a sequence of sentences by applying various macrorules. It does not have functional character, and is not defined in opposition to a comment function. But, of course, each macroproposition (or expression thereof) may again be assigned topic and comment functions (viz., relative to other macropropositions of the same level). Yet, the notions are not unrelated. Since sentential topics are defined in terms of contextual information, it may and will often be the case that the topic of discourse (e.g., the macroproposition of a fragment of the text) defines what is already known by the hearer and, more intuitively, what the upshot is of the given information of text and context. A sentence used to add new information may therefore take as its topic a concept that is part of this macroproposition. Thus, in a story about Johns train trip to Berlin, we naturally expect the expression *John* in subject position to carry the topic function in many sentences (e.g., also because of the topical role of 'John' in the macropropositions of the story):

(34) John went to the station
    John took a train
    John met a linguist on the train
    …

However, this link between macrostructure and the topical organization of sentence information is not direct, because the text topic or theme pertains to

the global information of a passage and does not indicate how the information is linearly distributed. Hence, it is rather the structure of the *sequence* that will determine the topic-comment functions of sentences. In the story summarized by (34) we may well have sentences like:

   (35) The train was very fast.
   (36) The linguist gave him a cigarette.
   (37) The linguist worked at the University of Warsaw.

where the topics are 'train,' and 'linguist,' respectively. Hence, the topic is the semantic-pragmatic function that selects which concept of the contextual information will be extended with new information. Note, by the way, that the definition of topic in terms of 'known' or 'given' information alone raises problems, for instance, for the assignment of topic function in examples like (36). There, both the concept of 'linguist' and the concept ('John'), expressed by *him*, are known. In that case we could, by definition, take the ordered pair ['linguist,' 'John'] as the topic, and the really 'new' information 'gave a cigarette' as the comment. If, however, we would like to assign topics on the basis of the intuitive criterion of what the sentence 'is about'(e.g., the linguist) and what is said about this thing, we would assign topic function to 'linguist.' A test question like *What did the linguist do?* would correctly yield such an answer. But, of course, we could also ask *What did the linguist do with/for John?* or *What relation was there between John and the linguist?* In that case the topic is complex as indicated before. In other words, *semantically*, topic identification can only be made explicit in terms of the semantic information of previous sentences of a sequence in a discourse or conversation (or a description of a context of communication). In case we should have it that *pragmatic* or *cognitive focus* requires only individual concepts, we could say that 'Linguist' is topic and 'gave him a cigarette' is comment. Later we have to see what the cognitive aspects could be of this kind of 'focusing' on certain concepts. That such concepts may be complex is clear from examples like:

   (38) John and Mary were playing chess.

where we would normally assign topic function to the full complex term 'John and Mary.' Problematic, then, are sentences like:

   (39) He wanted to play chess with her.

for example, after sentences like:

   (40) Mary wanted to go to the theatre with John.
   (41) John phoned Mary.

Semantically, we can merely say that ['he,' 'she'] is topic in (39) because both referents are known to the hearer/ reader after either (40) or (41). However, if previous information also includes the topicality of a concept in a previous sentence [e.g., in (41)], then 'he' may be assigned topic function in (39) after (4 1) and 'she' after (40). The same holds for the influence of macrostructural information: lf Mary is the central participant in a story in which (40) occurs, then 'she' might be assigned topic function in (39); intuitively 'new 'in that case is what some boy, previously identified, wants to do with her, which may well be new information about *what happens to Mary*.

   From this brief discussion we may conclude the following: If only one level of description for sentence topic is taken, we may have explicit ways to identify such topics, but they do not necessarily fully account for our intuitions about sentence topics or for the various grammatical ways of expressing topic functions. After all, there must be a difference between (39) and:

   (42) They wanted to play chess together.

At the semantic level of description we only are able to give a definition in terms of interpretations of previous discourse or conversation or, perhaps, in terms of an abstract (contextual) information set.[21] In general, topic and comment, as we see, have to do with information distribution and selection, but this also involves pragmatic and cognitive aspects, so that a general theory of topic and comment should be an interdisciplinary theory, involving both grammatical and pragmatic or cognitive aspects. For our discussion it is relevant to repeat that sentence topic and discourse topic are different notions, which are intuitively linked by such concepts as 'what is the information about,' or 'what is the center or focus of the information.' More interestingly, we further see that macrostructures, as discourse topics, may belong to the contextual information set which in a sequence may codetermine what the topic(s) of a sentence is (are): Given two (known) concepts, of two participants in a story, it may indicate as the (main?) topic the concept that occurs in the macrostructure (e.g., 'Mary' if it is a story about Mary).

   We later see that, conversely, topics of sentences and sequences may, in discourse comprehension, be used in the strategic formation of macrostructures, given the canonical links between subject, agent, and topic.

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[21] The importance of an *information* set in formal semantics and pragmatics has been demonstrated by Groenendijk and Stokhof (1975, 1979).

2.10. MACROSTRUCTURES AND GRAMMAR

2.10.1.   Although it cannot possibly be our aim in this book to provide also the full characterization of microstructures (e.g., the structures of sentences and sequences), we can show the linguistic relevance of the notion of macrostructures by indicating how they are linked to structures and phenomena that are usually accounted for by the *grammar*. Clearly, we have taken macrostructures of discourse as part of the concept of meaning of a discourse and have indicated how these global meanings are related with the meanings of sentences and sequences. That alone is an important task of a serious text grammar. However, both micro- and macrosemantics should be linked with syntax, the lexicon, and phonology or morphology. Similarly, we should specify whether and how macrostructures are expressed *directly* in the discourse, because until now we only discussed the indirect link (viz., via the meanings of sentences).

2.10.2.   In our example analyses we have observed that sometimes we had to apply a ZERO rule, which says that information of the text itself may have a macrostructural function. In other words, certain macropropositions are *expressed* by the discourse.[22] Thus, in the Supreme Court text the first sentence contains the proposition 'The Supreme Court made a decision in the Bakke case.' Such sentences, which often occur at the beginning of texts, especially in newspaper texts, are called *topical* or *thematical*. Their topical role is usually illustrated by the fact that the subsequent sentences specify the more detailed information that is deleted, generalized, or constructed by the macrorules, yielding a proposition that is identical with that expressed by the topical sentence. We find the same in the Berlitz text: *The Berlitz method has been the most successful language tuition system in the world*, which directly expresses in the text the most important macroproposition.

   According to our remarks on *representation levels* made in Section 2.8, we may say that topical sentences involve a change in level. This means for instance that we cannot simply connect, within one sentence, propositions at one level with those of another level:

   (43) John made a trip to the United States, and he took a cab to the airport.

We would need a new sentence, starting to describe the respective actions summarized in the first, topical, sentence. The *coherence constraints* involved

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[22] We need not go into much detail as far as 'surface' expressions of macrostructure are concerned because they have recently been studied by Kay Jones (1977).

in such cases are not based on the usual conditional relations between facts but rather have a *functional* nature: The following sequence has a *specification* function with respect to the thematical sentence.

2.10.3. In the same way, macrostructures may also typically be expressed by sentences with a specific place and function in the discourse (viz., *titles, subtitles,* and *headings*). Thus, the title/ head of the Berlitz text appropriately expresses part of the macrostructure. The same ho1ds in newspaper titles or titles of scholarly papers. Of course, if the macrostructure is complex, only part of it can be expressed in this way (e.g., the highest macrostructure) or the most important macroproposition of the highest macrostructure. Here the importance of course may well he a personally or socially determined main aspect of the global information or an evaluation of an event (e.g., *Bakkelash* as the title for the Supreme Courts decision).

   Titles and headings have an important *cognitive* function, as we see in more detail later. They are important for the reader in establishing hypotheses about the macrostructure of the discourse. Without them, it is sometimes difficult to decide from the first sentence of the discourse what the global topic is. In extreme cases it may even he that the discourse is ambiguous or too vague without thematical sentences or titles, because the details of the text could illustrate many possible topics. Once a possible macrohypothesis is established, the reader/ hearer can also activate the necessary knowledge frames that are applied in the establishment of local coherence.

   It follows that a theory of macrostructures allows us to account for the relations between titles and text.

2.10.4. A special case of thematical expressions are *summaries* and *paraphrases* in a text. They do not merely express one macroproposition but rather the whole macrostructure, or at least the highest macrostructure level of a text. They typically occur at the beginning or at the end of a text [e.g., as proposed *abstracts* (in psychological papers for instance) or in *concluding summaries* at the end]. This need not be at the beginning of the end of the whole text but may also be the case for sections or chapters. Cognitively, such summaries have the same function as thematical sentences: They prepare the reader by indicating what the text is globally about, which is important in macrostructure hypothesis formation and, in the case of proposed abstracts, to indicate whether the reader would be interested in reading the text at all. At the end they confirm or simply repeat the macrostructure of the text as formed by the reader or at least express what the author found to be the more important information of the text. This means that thematical sentences, titles, and summaries also have an important communicative function: They indicate an *appropriate* reading for the text, by expressing the macrostructure of the text as intended by the author, so that *correct* understanding of the text

is possible. This is necessary because, as shown later, macrostructures are formed as a function of the cognitive set of the reader (knowledge, interests, goals, etc.), so that misunderstanding at this abstract level is possible.

Summaries not only occur within the text or fragment that they summarize but also may function as *independent* types of discourse. In everyday conversation we often summarize what others have told us, we are asked to summarize a novel or paper we read, etc. Summaries, indeed, are typically discourse-length expression of the macrostructures of a discourse. The linguistic properties of such a summary require some specific remark. Because they are discourses in their own right, they should satisfy the normal conditions of local and global coherence. So, the sentences must be linearly connected, and if the summary is relatively long, it will once more have a macrostructure, which may again be expressed by a shorter summary. Note, however, that although a macrostructure is, by definition, explicit, a summary may again lack all those propositions that need not be expressed (e.g., for pragmatic reasons). Also summaries exhibit the usual redundancies and perhaps irrelevancies of any other discourse. Especially in natural summaries, that is, those we give in natural conversations about discourses we have heard or read, the summaries will more often than not hard1y be an ideal expression of an ideal macrostructure of the other discourse. Instead they show what the summarizer found relevant in the other discourse. Interesting in such cases is the normal mixture of our own descriptions and evaluations of reality and those of the discourse that is summarized, leading to the usual opaqueness of reference and evaluation:

(44) John said that he hates your guts.

which need neither be a literal rendering of what was said nor a correct expression of the macrostructure of what was said. The many interesting linguistic and philosophical aspects of this kind of opaqueness are not dealt with here. Important for us at the moment is merely the fact that in many cases sentences and sequences under the scope of *verbi dicendi* are (small) summaries of other discourses, which express the macrostructures, and that the style, description, and evaluation of such summaries depends on the comprehension and the cognitive set of the summarizer.

Another feature of summaries is the inevitable global nature of the concepts involved. They do not contain, by definition, a precise description of events or actions but exhibit predicates denoting rather general or global facts.

Previously we also mentioned *paraphrases* because they sometimes also have a summarizing character. Strictly speaking a paraphrase is a discourse, consisting of one or more sentences, that express the same semantic content, also at the microlevel, as another discourse (e.g., by different words, syntactic

constructions, and generally different style). We hereby ignore the difficult problem of whether a paraphrase in this sense is really an expression of the *same* meaning. Especially if we assume that in most if not in all cases different expressions also involve different meanings or at least different contextual (e.g., pragmatic) functions, we can hard1y speak of paraphrases expressing the same meaning. Hence a paraphrase merely expresses a similar meaning, whereby the paraphrase as an independent discourse is constrained not only by the meanings of another text but again by the comprehension and cognitive set of the paraphraser, thereby expressing at the same time the beliefs and attitudes of the paraphraser. In a looser sense, then, a paraphrase may be close to a summary as soon as more detailed information of the paraphrased text is paraphrased with 'fewer words.' If a paraphrase expresses a variant of the meaning expressed by the paraphrased text, we might say that the *set of possible paraphrases*, expressing the *set of similar meaning variants* of a given text, may be defined in terms of the macrostructure of the lowest, level of the original text. In that case the variants remain within the bounds of what has been called the upshot of the text, even if details would be different. Without the notion of macrostructure we would not be able to define such a set of acceptable paraphrases. Similar remarks may be made for rough *translations*: Cultural differences at the microlevel are acceptable within the maximum bounds of the lowest level of macrostructure.

2.10.5. We have now briefly surveyed a number of textual expressions o macrostructures (viz., topical sentences, titles, summaries or abstracts, and approximate paraphrases). We have briefly observed as well that such expressions may have peculiar grammatical properties such as specific constraints on their connection with clauses or sentences of another description level. Of linguistic interest, however, are also a number of other structures and expressions that indicate the presence of either thematical expressions or underlying macrostructures.

First we have the set of *topic indicators*. We often not only express macrostructures by thematical sentences or summaries but also explicitly indicate that these expressions have this particular function. Examples of topic indicators are:

(45) (a) global metasemantic expressions
        -this discourse will be about...
        -I shall speak about. . .
        -the topic of my talk will be... (theme, gist, upshot ...)
        and their past-time variants (for the end of the text) and third-
        person variants *(he said, her talk, ...)*

 (b) summary indicators

-*summarizing, ... ; let us resume ...*
-*in brief, in short, in other words, ...*
-*we may conclude... ; we have seen that ...*

 (c) relevance indicators

-*the most important (relevant) thing is ...*
-*primarily, crucially, especially, ...*
-*it should be stressed that...*
-*I repeat (recall) that ...*

The examples are particularly frequent in scientific discourse, where the role of correct understanding of the main topic or results is important or where didactic aspects may be involved. Many of the expressions have been used frequently in this book, but they also occur in everyday conversation and other kinds of discourse.

Among the topic indicators, we have found a number of stereotyped phrases and characteristic adverbs. Other indications of macrostructure appear in *connectives* of various kinds. Connectives, as we have briefly assumed at the beginning of this chapter, express relations between facts. Also they may be used to express relations between speech acts. In both cases macrostructures also may be involved. It may happen for instance that a connective does not link two propositions of the microlevel but two propositions at the macrolevel or a macroproposition and a microproposition. For instance, the sentence initial *But* in (20, n) of the crime story fragment links a (complex) proposition with the preceding sequence as a whole: looking at the girl, having a guilty conscience about it, and thinking how it would be to go out with her. The *But* in that case indicates a break in a sequence (here of thoughts) or, in general, the nonsatisfaction of expectations. The same holds for the use of causal connectives like *For* [as in proposition (132) of the *Bakkelash* text. In general, sentence initial connectives may link whole sequences of propositions. *Moreover* adds a fact to a series of facts. *However* indicates a contrast, a nonsequitur, the nonsatisfaction of an expectation, or the exception of a regularity and may have a whole sequence as its scope. The phrasal connectives *on the one hand and on the other hand* also may indicate opposition or differential consideration in which many propositions may be involved. Initial *But* has been mentioned previously, and the adjectival connectives *yet* and *nevertheless* may also have these functions as contrastives. It is especially the semantic-pragmatic connective *So* that has important macrostructural aspects, because it may indicate the conclusion from a whole set of arguments, facts, or premises. In that way it, also may function as a pragmatic connective,

because it may link assertions by the functional relation of a conclusion. In Chapter 5 we investigate in more detail these relations between pragmatic and semantic macrostructures, whereas in Chapter 3 the schematic role of such global connectives is discussed.

We have not only indicators for the introduction or conclusion of topics or connectives to relate topics but also expressions that *indicate changes of topic*: *Yes, but. . . , But, did you hear this? ... ; Speaking about John, did you know that ... ; We now will see whether... ; Lets talk about something else...* ; etc. They are important devices for correct interpretation in discourse comprehension, because they signal to the language user when to produce or construct a new macrostructure. These indicators not only are lexical but also, may be phonological, phonetic, or graphical. Thus, we have *pauses* to indicate a change of topic in conversation and *whites, paragraph indentation* in written discourse. Similarly, we may have specific intonation, pitch, or volume at the beginning and end of text units (e.g., 'paragraphs' in spoken discourse, to mark the introduction of a new topic and hence a change of topic).

2.10.6. Apart from the explicit topic indicators, perhaps the most pervasive grammatical features used to express underlying macrostructures are *pronouns, PROverbs, definite articles, demonstratives,* etc. Especially the expressions *it, that, this* may be used to refer to individuals that are not represented coreferentially in the previous part of the text by a single expression. Thus, *it* may refer to a complex, higher-order event that has been described by a long previous fragment of the text, even if the global concept itself was not expressed. For a correct interpretation of such referential expressions, as well as of the occurrence of definite articles before nouns that have no coreferential counterparts in the previous part of the text, we must assume that macrostructures are present which have concepts which are the basis for coreference. Thus in Sentence 4 of the Field versus Laboratory Experimentation text (Table 2.2), we find a *this* which refers to the global concept of 'concern' which is part of the macropropositions of the first few sentences.

What holds for PRO-elements in particular holds for the full expressions in general. The use of *nouns, adjectives,* and *verbs,* for instance, may indicate states of affairs or events that have been represented before in the text by a whole sequence of sentences. Thus, in the Bakkelash text we find the adjective *divided* that represents the sequence of facts about the different opinions of the various justices of the Supreme Court. The same holds for the noun *decision* itself, which expresses the global event later specified in the text. Such expressions of macrostructural concepts may also be called *topical* or *thematical*, just as we did for whole sentences before. The traditional term for such expressions is that of *key word*, although this notion also involves the specific context of relevance of certain concepts for the users of information.

Finally, it should be observed that many of the topical indicators mentioned in this section are not only used to signal macrostructures of a fragment or whole discourse. Whereas some expressions, such as titles and summaries, are rather specific indicators, other expressions, such as connectives, are also used with their microstructural functions. For the latter the point of our brief analysis is merely that the grammar should specify that they can have *both* kinds of functions.

2.10.7.   In surveying the various grammatical features of macrostructures we should not forget to repeat the importance of such structures for *semantic coherence at the local level*. It has been demonstrated that macrostructures define the global coherence of a text. However, it has also been shown that local coherence cannot only he defined in terms of linear connections between facts but that this connection is relative to the topic of the sequence: Whether two facts belong together depends on what the topical point of view of their connection is. Thus, buying a ticket and walking to the train is an acceptable connection under the 'taking a train' topic but not in the 'going to the movies' topic.

Thus, we have also observed previously some examples of coherence where we have a sequence of sentences expressing a macroproposition and a microproposition.

Besides these various general and more specific constraints on local coherence, the macrostructures also have a more abstract semantic function: They define global constraints on *lexicosemantic selection*. Given a certain topic, only a limited class of concepts are expressed by the respective clauses and sentences of a text. We have seen that without such a macrostructural constraint an even linearly connected text may 'go anywhere' by successive associations and conditioning. 'Staying' with a topic however also requires a delimitation of *ranges* of *semantic* space for the interpretations of text sentences.

2.10.8.   We have surveyed a number of linguistic phenomena that may be considered to be further evidence for the relevance of macrosemantics in the study of discourse. Clearly, this survey has not been complete, and further empirical study ¡s necessary to discover other grammatical facts that can only be accounted for in terms of global semantic structures. The occurrence of key words, topical sentences, summaries, titles, topic and summary indicators, Importance markers, macroreferential pronouns, articles, connectives and adverbs, specific graphical devices like pauses and paragraph indentations, intonational phenomena, specific morphemes or phrases to mark topic change, and above all the fundamental conditions on the coherence of clauses and sentences, gives ample evidence for the grammatical relevance of semantic macrostructures.

This contribution to the study of the grammar of sentences and sequences adds to the more general theoretical account of the notion of *global meaning* of a discourse, as it is intuitively denoted by such terms as topic, theme, upshot, gist, or point. We have shown that with the usual semantic means, by adding a number of semantic mapping rules (vis., the macrorules), it is possible to give an account of such global meanings and to specify how they can he derived from various kinds of discourse.

2.10.9.   The account given of semantic macrostructures in discourse is still very tentative, and many problems have not been solved. Some of the issues are taken up again in Chapter 6, where they may receive more complete and adequate treatment. Thus to understand the specific role of macrostructures in semantic interpretation, a further cognitive analysis is necessary. Similarly, to understand their role in communication we have to investigate their pragmatic and interactional functions. Similarly, the operation of macrorules and the identification of macrounits is possible only when we have more insight into the nature of knowledge or other cognitive factors used in the formation of macropropositions. In that perspective also the analysis of action provides better insight into the global meaning structures (e.g., in terms of plans and purposes) of action descriptions and stories.

We have encountered the very serious problem of macrorule ordering and made only very tentative suggestions about such a possible ordering. We have not considered what happens if there are no global concepts available in order to make macropropositions. In general our rules and their application could only he semiformal, and, due to the lack of an explicit knowledge base and an explicit formal semantics for natural language, the various inferences were sometimes ad hoc. Also we have not worked out the kind of (text) grammar in which macrostructures are to play a role, except for some remarks about its semantics and brief hints at possible surface structures.

Finally, there is another important limitation in this chapter: We have only studied macrostructures in monological discourse. It goes without saying that a sound linguistic theory also should specify how topics of conversation (and of other dialogical discourse types) are formed. In that perspective also a theory of *topic change*, with appropriate rules and strategies, should be developed. In Chapter 5 we briefly return to this issue.

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[11] See Grimes (1975) for a first intuitive approach of these functional relations between sentences in discourse.

[15] Note that in the notion of 'relevance' here is not the same as that used elsewhere in this book, where it does not simply denote any kind of connection but rather the thematic importance of propositions. For discussions about 'relevance logics,' see the references given in footnote 14.

[16] The notion of 'prominence' in discourse has been used to define 'themes' by Kay Jones (1977).

[17] Different kinds of relevance assignment both at the micro- and the macrolevel are discussed in van Dijk (1978c).

[18] The importance of the latter notion of (life) theme has been recognized by Schank and Abelson (1977), where it is defined in terms of major motivations and goals of persons or represented persons in stories.

[19] This kind of functional or rhetorical relation between sentences or propositions has been given attention by Grimes (1975), who however does not merely distinguish among semantic, pragmatic, and stylistic/ rhetorical functional relations. In psychology, Meyer (1975) has used the categories of Grimes in memory experiments.

3 Macrostructures and Superstructures

3.1. SUPERSTRUCTURES

3.1.1. The macrostructures that we obtain by applying macrorules on the semantic structures of textual sequences appear to be sequences of (macro) propositions. These sequences are ordered and must be linearly coherent. They may be organized in MACROFACTS in which the various semantic roles of participants in global events can be specified. However, besides these kinds of semantic structuring, macrostructures until now are hardly *organized*. Now, one way of further organizing sequences of sentences or propositions is to assign various *functions* to those sentences or propositions in the sequence. Thus, we have seen that we may speak of such 'rhetorical' functions as 'explanation,' 'specification,' 'comparison,' or 'contradiction.' In this case we assign sentences or propositions to functional categories, which define the kind of functional relation they have with respect to other sentences or propositions. Thus, *B* is a 'specification' of *A*, if the information of *B* entails the information of *A*, which means that *B* must give more particulars of the general information that *A* and *B* have in common:

(1) John was ill. He had the flu.

These functional relations need not hold between individual sentences or propositions but may also have *sequences* of sentences as their scope. A specification, as we have seen also in analyzing macrostructures, may be given by a longer sequence:

(2)   John was ill. He had the flu, with high fever. He felt really bad and
called a doctor....

We see that the topical sentence *John was ill*, which expresses the
macroproposition of this passage, at the same time functions as the
expression of the global information to which the rest of the fragment gives a
specification. Similar remarks may be made for the function of 'explanation':

(3)   Mary flunked her linguistics exam. She hadn't worked enough, and
the questions were difficult. And she doesn't like linguistics....

An explanation is the specificiation of a set of conditions that are the
assumed reasons or causes of a certain fact; the explanation is usually given
after the proposition representing the fact that should be explained.

3.1.2. What has just been briefly mentioned for sentences or propositions
holds not only for sequences but also for *macropropositions*.[1] The
macroproposition 'KH is frustrated because his wife is absent' functions as
an explanation for the macroproposition 'KH looks at pretty girls.'
Similarly, the macroproposition 'You learned a language easily and
effectively when you were young' stands in a *comparison* relation to the
macroproposition 'You learn a language easily and effectively by the
Berlitz method' in the Berlitz advertisement analyzed in Chapter 2.

   Now, what interests us in this chapter are those functions of
macropropositions that have become *conventionalized* in a given culture.
These conventions may lead to the establishment of fixed *schemata*[2] for the
global content of a discourse. Such functional schemata are so to speak the
global form or 'syntax' for the global meaning of a text. To differentiate,
however, between these global structures and the global semantic structures
we have analyzed thus far, we speak of (schematic) *superstructures*. Hence,
superstructure is the schematic form that organizes the global meaning of a

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   [1] What is said here and in the following paragraphs about the functional and superstructural
organization of macropropositions also holds for the more complex units that we have called
MACROFACTS. It appears that the terminal slots of superstructural schemata indeed are
usually filled with these more complex MACROFACTS.
   [2] Instead of the more precise and specific term 'superstructure,' in this chapter and else
where in this book we sometimes use terms like 'schema,' 'conventional schema,' and
'narrative schema', mainly for reasons of stylistic variation and to avoid heavy collocations of
technical terms like 'macrostructure' and 'superstructure.' Note however that the notion of a
schema is more general or has other, more specific meanings in current psychology and
artificial intelligence (see Chapter 6). From the content of use it is clear whether we are using
the term in a more general cognitive sense or whether we are speaking about superstructures.
Terms like 'narrative schema' are widely used in cognitive psychology (see references in
footnote 4, p. 112, and those in Chapter 6). We have introduced the term 'superstructure' in
van Dijk (1977e, 1978f).

text. We assume that such a superstructure consists of *functional categories*. Besides such categories we need *rules* that specify which category may follow or combine with what other categories. Thus, in our earlier examples of functional relations, we see that explications and explanations follow the propositions explicated or explained, which may denote a general or important fact.

   The conventional schemata we have in mind not only involve functional categories for the macropropositions of a text and rules for ordering and combination, but also require that these categories and rules be socioculturally accepted, learned, used, commented upon, etc., by (most) adult language users of a speech community. Perhaps the most characteristic example of such a conventional, schematic superstructure is that of *narrative*. A narrative structure is a global schema expressed by *stories*, mostly, but sometimes also in other types of discourse (epics, parables, advertisements, myths, rumors, etc.). In the following we briefly discuss the structure of narrative schemata. Here, it is important that the correct distinctions are made. A narrative schema or superstructure is *not* the same as a story. A story is a discourse which expresses a macrostructure which is organized by a narrative schema. And, a narrative schema, therefore, is *not* the same as the global content of a story but merely the categorical structure that organizes this global content. Hence, macrostructures and superstructures should be carefully distinguished: The distinction is similar to that between the meanings of sentences and the functional syntax (subject, object, etc.) of sentences. Another well-known conventional superstructure is that of *argumentation*, where we have categories like 'premises' and 'conclusion.' Again, these are *forms* that may be filled with different meanings. We see, however, that such forms put certain *constraints* on the meaning content: Not any conclusion may follow any premises but only those propositions entailed by a sequence of others.

3.1.3.   It cannot possibly be the aim of this chapter to provide a theory of superstructures. A separate book would be needed for such a theory, and we would even need separate studies for the different main kinds of superstructures, such as narrative or argumentative structures. After some more general remarks about superstructures and some examples, we therefore focus on the assumed constraints from superstructures on the formation of macrostructures.

   A first general problem we have to tackle is that of the *generality* of superstructures. Although many kinds of discourse have conventional schematic forms, it is not obvious that *all* discourses have such fixed superstructures. Conventions will of course be established only for those discourse types which occur frequently and which require effective Production and comprehension by means of fixed schemata. Everyday

conversations, narrative discourse, and arguments are examples in point. Then we have the discourse types that have institutionalized schemata, such as scientific papers, legal documents, church rituals, court proceedings, exams, and lectures. On the other hand, there hardly seem to be fixed forms for advertisements, (modern) poems, personal letters, etc. It is a task for empirical research to establish for each discourse type the possible schematic superstructures. A general theory would only be able to abstract from the various kinds of superstructures to indicate how they are related to the other structures of the text and also how the superstructure relates to all kinds of *contextual* properties of discourse use in communicative interaction. Although certain superstructure schemata may offer valid indications of the text *type,* a general typology of discourse cannot only be based on such superstructures. The pragmatic and sociocultural functions of discourse are at least as important as the various textual properties, such as global content (macrostructures), style, and superstructures. Thus, an advertisement general has the macrostructural property of positive evaluation of certain goods or services but at the same time requires definition in terms of the pragmatic notion of speech act (advice, exhortation, etc.), both within the more general sociocultural and economical contexts of consumer needs and behavior. Something similar holds for various sociopsychological aspects of discourse use: Some of the properties of stories can be understood only if we assume that storytelling has important cognitive and emotional functions. These few remarks are made to stress the following general points: Superstructures do not define discourse types alone; discourse typologies also require many contextual factors, ranging from cognitive to socioeconomical ones; and finally it may be the case that certain categories and rules of superstructures -as well as macrostructures, style, etc.- of discourse are, at least originally, functional with respect to the contextual aspects of communication and interaction. Thus, both everyday conversation and the various discourse types in court are globally organized in close relation with the respective interaction constraints of their contexts.

As far as the more abstract properties of superstructures are concerned, it would be fruitful to recall the basic *functional* categories that we discussed in subsection 3. 1. 1. We may assume that *these* functional categories hold for discourse in general, because they apply to the sequencing of information in any discourse type, at least at the microlevel.

With this kind of functional relation in mind, we may speculatively assume first that many discourse types exhibit some kind of *Introduction.* This global schematic (meta-)category[3] may of course be different for the various discourse types (e.g., the Setting in a story), but in general it provides the

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[1] We here speak of a metacategory because it does not denote a category of a specific discourse type but rather a category in a more general, higher-level, theory of superstructures.

following kinds of information: (1) background knowledge; (2) time and. place; (3) major participants; (4) the actual state of affairs or problem; and (5) the topic, global plan, etc., of the text. In other words, the Introduction specifies the necessary *presuppositions* with respect to which something 'new,' 'interesting,' etc., can be said. In this respect there is some similarity with the semantic-pragmatic function of sentence topic, which is also sometimes intuitively characterized in terms of 'starting point' for a sentence.

Next, the final categories of discourses may have rather general properties with a schematic nature, which may he captured with the term *Conclusion*. For argumentation this category is obvious and hence also for all discourse types that have argumentative nature, such as arguments, debates, meetings, scholarly books and papers, lectures, propaganda, and advertisements. Yet, we also find Conclusion-type categories in everyday conversation and stories. Conclusion categories contain the following kinds of information: (1) conclusions in the strict sense; (2) closing; (3) summaries; and (4) decisions for future discourse or action.

Apparently the 'middle' categories, which constitute the so-called 'body' of the discourse, are 'freer'. But, very often a general Introduction is followed by a category in which something new or interesting must be stated with respect to the situation or problem mentioned in the Introduction. Given a stable course of events or state of affairs in the Introduction, this second category may also mention an arising problem, an unexpected event, etc. Let us provisionally use the general term *Problem* to indicate this category type.

Given this way of formulating the category that comes after the Introduction, we may suspect that the next metacategory is of the *Solution* type. In such categories we expect information about the solution or resolution of problems, answers to questions, or outcomes of complications and reactions to actions or events.

Finally, many discourse types contain a separate prefinal category with all kinds of *Evaluation*: Consequences and results may be discussed and evaluated; the remaining problems stated; and the relevance of the information for the reader/ hearer mentioned (although this also often takes Place in Conclusion categories, as in the Moral of a story).

We thus arrive at *four or five* basic metacategories, which may receive their more specific nature and function for diverse discourse types. Maybe our abstractions have become so general that they do not tell us very much. Yet, a general theory of superstructures can hardly be seriously undertaken when we do not attempt to go beyond the particular schemata of certain discourse types. It is striking that many of the conventional schemata we know seem to have this articulation in four or five main categories: stories, scientific papers, dramas, and arguments rather closely follow the general line in this respect.

Of course, if a general metaschema holds for discourse, this would not be arbitrary. The factors underlying the formation and conventionalization of schemata would be of the following general nature:

(a)   the necessity of ordering, organizing information units (propositions), by functional categories;

(b)   the semantic-pragmatic constraints on information distribution (e g., presupposition-assertion articulation);

(c)   the pragmatic aspects of the discourse: what is the general point or function of the discourse as an act for the hearer/reader;

(d)   the interactional aspects of speaking, writing, and reading/hearing: how to start; how to stop; relations between speech participants; etc.;

(e)   cognitive aspects: as previously for information acquisition, plus needs for expression, evaluation, news, problem solving, suspense, etc.

Although this list is far from complete, it may give an impression of the more general semantic, pragmatic, and contextual constraints that may have given rise to the establishment of informational functions and the conventionalization or even institutionalization of schematic categories. Our task in this chapter is to show how superstructures play a role in the organization of global meaning of texts.

A final methodological remark is in order. Whereas semantic macrostructures were taken to be the legitimate object of discourse semantics and, hence, of a text grammar, the superstructures discussed in this chapter do not properly belong to linguistics or grammar but are the object of a more general theory of discourse or a still more general theory of semiotic practices. The categories and rules involved cannot be defined at the usual levels of grammatical analysis and require separate theories (e.g., a narrative theory), because the relevant structures may also manifest themselves in other semiotic codes (e.g., in pictures or gestures). We see later that this means theoretically, that superstructures of a specific kind are to be mapped onto semantic macrostructures of discourse. The purpose of this chapter though is not to analyze the formal properties of these mappings: We only give an informal description of the constraints on superstructures or macrostructures.

3.2. SOME SUPERSTRUCTURE TYPES

3.2.1. Narrative

3.2.1.1. Perhaps best known, also in everyday communication, is the schematic structure of *stories* -that is, the *narrative* superstructure.[4] Besides
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[1] The literature on narrative structures is very extensive and cannot fully be accounted for here, nor can all results and problems of that research. Most work has been done in literary scholarship, at least originally, first in all kinds of classical treatments about dramatic discourse

the more artificial story types, such as novels, dramas, short stories, folktales, and myths, we tell stories in our daily conversations to express our personal experiences or to impress hearers with what happened to us or to people we know. Although there are considerable differences between a complex novel and a natural (everyday) story, they have some basic narrative categories in common. The novel in general has specific further constraints, certain transformations of the *canonical ordering* of the schema, specific themes, and a different style. Here we ignore the numerous variations among different narrative discourse types in various cultures and historical periods.

3.2.1.2. The first typical category of narratives is the *Setting*. Settings in general feature descriptions of the original situation, the time and place of the various episodes, a description of the main character(s) involved in these episodes, and possibly further background information about the social or historical context of the events. In natural narratives, such Settings may be very brief or even deleted when they are supposed to be known to the hearer. Typically short Setting sentences are:

  (4) This morning when I came in the office....
  (5) Yesterday I was driving on Highway 10....
  (6) Last week Harry came to see me....

Here only time, place, and the main participants are introduced. Note that such sentences start the proper narrative. Stories however also have all kinds

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types (beginning with Aristotle) and later, around the end of the last century, with various theories of the novel. Much of the literary work in this area has been focusing on problems of representation, relations of fiction and reality, style, themes, etc., mixing micro- and macrostructures of various kinds and superstructures.

   New developments of the study of narrative from a structural point of view have started in anthropology, first with the seminal work of Propp (1958). This work has inspired anthropologists and literary scholars nearly 40 years later in the framework of the so-called structural analysis of stories, which was first manifesting itself in France, in work by Barthes (1966), Bremond (1973), Greimas (1966), Todorov (1969), and others (see *Communications*, 1966,*8*). For surveys, see van Dijk (1972), Culler (1975), and Gülich and Raible (1977). Somewhat later this development was combined with the generative principles of transformational grammar in various attempts to formulate 'narrative grammars' (e.g., Prince, 1973; van Dijk, 1972). Another important stimulus from the social sciences has been the sociolinguistically oriented work of Labov and associates, which did not focus on literary or other 'artificial' narrative but rather on the structures of everyday stories (Labov & Waletzky, 1967). Our own work on narrative (van Dijk, 1972, 1976a, b, 1978e; van Dijk & Kintsch, 1977) is indebted to both these traditions in 'structural' analysis and has attempted to extend these by a text grammatical and generative framework, an action-theoretical foundation, distinctions between several levels of description, and later a cognitive component. It may be clear from these remarks that the discussion in this section is merely a short summary of some main results about the superstructural properties of narrative (which are only a part of a general theory of narrative of course). For a recent survey, see de Beaugrande and Colby (1979).

of preparatory expressions preceding them that function within the communicative interaction as *attention* markers:

(7) Hey, listen ....
(8) Do you know what happened to me yesterday?....
(9) Guess what ....

We do not count them among the proper narrative categories because they have a more general communicative function, which also holds for other kinds of discourse markers such as titles in written discourse.

After a certain Setting, a story typically brings an account of 'what happened' in that setting. Hence, the following category, that of *Complication*, contains an event or an action. The semantic constraint, however, is that this may not be any event or action, but it must be something that is worth telling in the first place: It must be a 'narratable' event. Just opening a door, a leaf falling, or driving your car in general does not qualify, because they are events or actions that happen so often and normally that they are not *interesting, spectacular*, or even *new*. Often, then, a Complication has a content representing something that breaks the established norms, routines, expectations, balanced situation, or normal plans or goals of participants. Typically, this is an event that is dangerous, funny, or simply unexpected for the participants (including the narrator or not):

(10) Suddenly, a cow crossed the highway ....
(11) She told me that she was pregnant ....
(12) Mr. Robinson died yesterday....
(13) I had lost my keys ....

Clearly, break of normalcy conditions are culture-dependent: What is complicating in one period or culture may not be so in others, so that often we do not understand what the 'point' is of stories from other cultures.

In general complications require a further category of *Resolution*: Language users are interested in knowing what 'happens next,' what the result or outcome is, how a predicament is solved, etc. A typical constraint in this case is the involvement of human (or human-like) participants and their *actions*. Thus, a Resolution in general features a (re-)action of a person to a previous event or action. If the complicating event was undesired or counter to the goals of the participant(s), we may expect that the Resolution will mention those actions that attempt the reestablishment of the original situation or the creation of a new situation in which further normal functioning is possible: how I coped with a problem, avoided an accident, solved a predicament, etc.

Then, as already specified in the more general metacategories of superstructures, we may expect that the central events and actions of a story be *evaluated* by the participant and/ or narrator in the category of *Evaluation:*

(14) God, I was so scared. .. .
(15) I was glad I was not there....
(16) I never met such a bore in my life....

Evaluations feature the global mental or emotional reaction of the narrator participant with respect to the narrated episode: whether it was nice, awful, funny, etc. Here the specific expressive function of stories appears most clearly, especially in natural narratives: They record not merely what happened to us but also what it did to us.

The general pragmatic function of narratives, finally, appears in the well-known category of *Coda* or *Moral*. Such a moral draws a conclusion so to speak from the events for further actions, both of the hearer and of the speaker:

(17) I'll never take him on a vacation again!
(18) Never drive at night in Mexico!
(19) Next time I'll stay home.

Morals are, as we see, not only explicit in fables or parables but also occur normally in everyday stories, especially when they are told to inform somebody about the possible consequence of doing something.

3.2.1.3. The respective narrative categories define a *hierarchical* structure: Settings may hold for the whole episode and so may Evaluations, whereas the pragmatic Moral in fact follows from the whole narration. Provisionally, we therefore find a narrative superstructure of the kind in Fig. 3. 1. This structural graph should be defined in terms of *formation rules*, which specify the rank and ordering of the various categories. Such rules would be partially *recursive*. For instance, we may have stories with different, successive episodes, several Complications, and (successful or unsuccessful) Resolutions. For specific discourse types we finally have *transformation rules*, which allow certain categories to be deleted under specific conditions or to change place. Thus, in our crime story we found that the original situation of the story (viz., the absence of KH's wife) is presented after the first instantiations of the Complicating events (viz., KH's weakness for pretty girls).

PONER ESQUEMA
FIG. 3.1.

3.2.1.4. The few remarks just made about narrative structures are far from an adequate theory of narrative. The important thing is the upshot of our argument, that certain types of discourse (viz., stories) have a global schematic structure and that this structure consists of a number of hierarchically related narrative categories. These categories are the functional slots for the 'content' of the discourse. Since the categories do not usually hold for individual sentences of a text, we must assume that the typical content of superstructure categories are *macrostructures*. In Section 3.3 we see how macrostructures can be constrained by the superstructure categories: We have already briefly observed that the Resolution category requires human (re-)action and that the Complication category should contain interesting events.

Note that the narrative categories indeed have a *conventional* nature. First, the ordering could be different: A Moral could appear at the beginning as well. Second, there is no need to provide the personal Evaluation of a Happening or, in general, to tell only about interesting events. Of course, as we have seen before, the conventional nature of the categories holds for those discourse types that are well-established; the original communicative, pragmatic, cognitive, or social factors remain as the general basis and explanation of the categories. Another important point is that the narrative schema does not, as such, contain a further analysis of descriptions of situations or *actions*. Of course, as soon as actions are described, the discourse expresses sentences denoting needs, emotions, motivations, decisions, intentions, plans, purposes, activities, results, goals, etc. However, these are not narrative categories; they belong to a more general theory of action and would at most be characteristic of the more general (meta-) type of

action description discourse, of which stories form a subset.[5] A police protocol would also be an action description, but it would not necessarily qualify as a story. Hence, the further analysis of all kinds of semantic notions, such as an event or action, belongs to more general theories and / or to semantics. This does not mean that such an analysis is not important. On the contrary, the structure of action is of crucial importance in our planning and comprehension of action and interaction and therefore also for our comprehension of action discourse and stories. We pay particular attention to action and action discourse in Chapter 4. What holds for actions also holds for the description of places, persons, objects, natural events, etc. In other words, in the linguistic or cognitive analysis of stories we must carefully distinguish the following aspects:

      (a) the schematic superstructure (the narrative 'schema');
      (b) the semantic macrostructures ('themes');
      (c) the semantic microstructures (local action description, etc.);
      (d) conventional frames and scripts about episodes;
      (e) general knowledge about actions, persons, etc.

3.2.2. Arguments

3.2.2.1. The structure of *reasoning* and *argumentation*, just like that of narrative, has been studied for a long time and, at least in more or less precise terms, in the classical Aristotelian tradition.[6] Schemata for admissible reasoning in syllogisms, thus, are well-known, and they are characteristic for what we understand by the more general notion of superstructure. Justas for other conventional discourse schemata, we here find differences between the *norm* or canonical structures and what is actually done by language users. In other words, our daily arguments seldom follow the acceptable forms of reasoning. More often than not certain categories remain implicit, or the reasoning as a whole is invalid. Here we do not consider normative schemata, let alone the rules for logical or mathematical proof or inference, but rather the structures of everyday argumentative discourse. In subsection 3.2.3 we

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[5]See van Dijk (1976a,1978e) for a discussion of the links between stories and action description discourse in general. We see later that much of the current work on narrative in psychology and artificial intelligence does not always make this distinction.
   [6] From the extensive literature on argumentation we may refer especially to the more recent studies of Toulmin (1958), Perelman and Olbrechts-Tyteca, (1969), and Geach (1976). In our discussion we neglect the various properties of the strategies involved in argumentation, as well as the logical and philosophical aspects of reasoning. We focus on the more global schematic structures of argumentative discourse. Some of the categories we use are borrowed from the well-known book of Toulmin (1958).

briefly look at a more particular type of argumentation, that of scholarly papers.

3.2.2.2. Hierarchically speaking an argument has a binary structure consisting of *Premises* and *Conclusion*, where the Conclusion contains information that is *inferred* from the information contained in the Premises. The further articulation of the argument structure takes place especially in the Premises. Premises just like the story, often feature a certain *Setting*, in which it is specified what the argument is about, who or what objects or notions are involved, what the problem is, and what the intentions of the speaker are (viz., to show that something is the case). A category that we may call that of *Facts* follows; it contains descriptions or assumptions about states or events that the speaker considers to be true or established and directly acceptable by the hearer. If Facts contains information that is not directly acceptable, an embedded argument, or at least a specification, may be necessary. To be able to draw a particular conclusion from such particular facts, the argument further needs a more general assumption about the relationship between these kinds of facts, e.g., in the form of a *Warrant.* The usual form of a statement in the Warrant category is of the implicative type: Always/ Mostly: if p, then q. Not only Facts-information but also Warrants may need further motivation or *Backing* (e.g., a statement about the relevance of the general implication).

Of course, the argument schema sketched here is very simple, and arguments may be much more complex and subtle. The schema would account for simple arguments like the following (where each category is expressed by one sentence, which need not be the case, of course):

(20)   (a) There is a meeting tonight (Setting).
     (b) John is ill (Fact).
     (c) 111 people usually do not go to meetings (Warrant).
     (d) The meeting is not extremely important for John, and he is too sick to go (Backing).
     (e) John doesn't go to the meeting tonight (Conclusion).

Again, several categories may often remain implicit, especially the general Warrant statement, because its validity is based on general or conventional knowledge, which for pragmatic reasons need not be stated in informal communication. The same may hold for the Backing (or Relevance) of the Warrant. Instead of the Premises-Conclusion ordering, we may also have the Conclusion-Premises ordering in those cases where an *explanation* is given of a certain fact. The two orderings are typically expressed in the following sentence types:

FALTA ESQUEMA
FIG. 3.2.

(21) John is ill, so he doesn't go to the meeting.
(22) John doesn't go to the meeting, because he is ill.

Sentence (22) would involve presuppositions about what the hearer already knows and will specify reasons that explain the facts known by the hearer.

We may finally resume the categories of arguments in the schema in Fig. 3.2.

3.2.3. Scholarly Papers: Experimental Research Reports

3.2.3.1. Besides stories and argumentation, it is perhaps the scholarly paper which has the kind of conventional or even institutional schema which is best known to the reader of this book.[7] We know how strict the norms of scholarly journals may be when It comes to both theoretical and experimental reporting. Early in our college careers we learn that papers should have an *Introduction* specifying a certain problem and its background (e.g., treatment by others, followed by theoretical development of a new idea or the refutation Of other proposals, a theory that may be backed up by concrete analyses,

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[7] The structure of scholarly papers has been discussed on a concrete example in van Dijk (1977b) and in Kintsch and van Dijk (1978), a more or less informal experimental paper from social psychology.

descriptions, or experiments). After that the *Conclusion* follows. Although this schema may be different from one discipline or even journal to another, the basic ingredients of scholarly communication in general are present, even in more or less informal essays.

3.2.3.2. To be more precise we merely present the approximate schema of the kind of scholarly papers appearing in journals of experimental psychology, as shown in Fig. 3.3. These papers are so conventional because of the internal constraints of methodology upon the reported activities (experiments) themselves. We again witness a case where external. communicative, factors influence the schematic structure of discourse. Just as for the story and the argumentation, we have used a right-hand (final) category which, properly speaking, lies outside the described or reported events but which contains the information indicating why the information is *relevant* for all purposes (e.g., certain practical *applications*). We may specify the Setting/ Background category further by such subcategories as 'discussion of previous theories' (survey), 'the description of problematic facts not accounted for by these theories,' etc. Again, it is not important to be complete here but merely to show that we do organize the global content of discourse in terms of sometimes fairly elaborate schemata.

   Note finally that the argumentation schema is often embedded in several of the categories of the scholarly paper schema. Variations of this schema may be specified for other kinds of papers and also for lectures, monographs, and for scholarly discourse in general.

   FALTA ESQUEMA
   FIG. 3.3.

3.2.4. Newspaper Articles

3.2.4.1. Although most of us read newspapers everyday, the general schema of a newspaper article is not generally known. For one thing, such a schema may be less fixed than those of narrative, for instance. Apart from different kinds of titles and headings, both on top and distributed in the body of the text, however, we recognize a specific introductory part, often Printed in bold or larger type. This introductory part (the 'lead') has several functions. First it is indeed the introduction, in which the major participants, place, and time (and, pragmatically, the news agencies) are given. However, at the same time, the introduction is often a partial summary, mentioning the major events. The next part specifies these events with further particulars. The final part of the newspaper article must be optional and in general will give details, because it is the part that newspaper editors must be able to cut if there is a lack of space.

   We see that the schematic structure is rather loose and consists mainly of *Introduction / Summary* and *Specification*, possibly followed by a *Detail* section. The introduction is also important within the context of newspaper reading and comprehension: It not only specifies the macrostructure, but functions at the same time as the abstract that one may read in skimming the newspaper.

3.2.4.2. Besides these main categories of the newspaper article, we might want to distinguish further functional categories that are sometimes distributed at different places in the text. First, we have a category of *Background* information. In this background category appears the information about the political and socioeconomical facts of a certain country or in general that information that is necessary to understand the news. Then, we may have a kind of 'previous history' section which provides the main events which precede the actual events mentioned; these we may simply call *Short History.* Both sections are of the summary type, because only the global facts must be known to understand the details of the actual news. Of course, newspapers may vary a lot in this respect: Usually 'good' papers provide more background and history. As for some of the other conventional schemata, we see here that *normative* and *qualitative* aspects may be involved in schema formation. Further we may also have an *Explanation* category which provides further information about particular events (e.g., by linking them with aspects of Background or History) and which implicitly involves general statements about social, economic, or political dependencies (laws, conventions, developments, etc.). Finally, also at various places, we may have more or less integrated sections of *Evaluation* of the reported facts which provides information about the actual point of view, attitude, evaluation, etc., of the journalist or newspaper.

3.3. SUPERSTRUCTURE CONSTRAINTS
ON MACROSTRUCTURES

3.3.1.   The point of this chapter, as we said, is not -even a fragmentary-theory of superstructures but only to show that macrostructure formation may depend on the superstructure schemata of a given text. Intuitively, we may understand this when we realize that the macrorules essentially define what is the important, relevant, or more abstract information in a given text and that this importance may change for the various communicative functions of the discourse, which again is related to discourse type and , hence, to schema. We see later that indeed the schema in discourse comprehension operates as one of the strategic monitors in global comprehension. In the more formal, text-theoretical, treatment of Chapter 2, it would therefore make sense first to define or derive, by specific formation rules, a specific schema (e.g., a narrative structure) after which the category slots are filled with macropropositions. In other words, it is the schema that imposes constraints on the macrostructure, at least formally. This does not mean that in actual comprehension and production it may not be the case that global content of a text would never influence the actual realization, ordering, etc., of the schematic categories. The nature of the information involved may require more Introduction, Explanation, Backing, Evaluation, or Conclusion, which in other texts, also of the same type, might be deleted (left empty).

3.3.2.   Superstructure categories appear to have a *functional* character: They define functional relations between (macro-)propositions in a text. This means, first, that they require *specific* information to be inserted in the category slots. One example has briefly been mentioned: In the narrative category of Resolution most stories have to represent human action, in particular action which is solving a difficulty or which is otherwise a 'remarkable' reaction to previous events. Similarly, the Warrant in the premises of an argumentation must be of a general, implicative nature (viz., the basis for the link between assumed facts and concluded or explained facts). Heavier restrictions are required in institutionalized schemata: The psychological report, for instance, requires very specific information about subjects, experimental materials, design, and results of experiments. This is even more important in legal and institutional documents and forms, where the schematic categories are often *questions* that must be filled out with specific information (name, address, date of birth, profession, etc.). Introductions or Settings give place, time, personal or social states of affairs, specific background information etc., whereas finally the Moral or Application categories specify future actions of the communication participants, advice, suggestions, etc. In other words, most of the schematic categories, defining the overall form of the text, require

specific macropropositions and hence indirectly specify what kind of information is important in the text. Let us try to demonstrate this assumption in a few examples.

3.3.3.   Take, for instance, the following story fragment:[8]

(21) Few parts of Italy, if any, are reckoned to be more delightful than the seacoast between Reggio and Gaeta. In this region, not far from Salerno, there is a strip of land overlooking the sea, known to the inhabitants as the Amalfi coast, which is dotted with small towns, gardens, and fountains, and swarming with as wealthy and enterprising merchants as you will find anywhere. In one of these little towns, called Ravello, there once lived a certain Landolfo Rufolo, and although Ravello still has its quota of rich men, this Rufolo was a very rich man indeed. But dissatisfied with his fortune, he sought to double it, and as a result he nearly lost every penny he possessed, and his life too. (Boccaccio, *Decameron*, 2nd day, 4th story)

This is the beginning of a classically built story and obviously the Setting of the narrative structure: It specifies the place, the (indeterminate) time, and the main protagonist of the story. The first sequence of propositions however is only about the region where the protagonist is from, but these particulars of the region are not further relevant for the story, so they can be deleted. Important only is the general concept of 'beautiful' applied to region, being connected to 'rich people,' which links to the richness of the hero. This generalization or even full deletion of the situational description is typical for the Setting of stories. We could also simply have had: *In a rich part of Italy there once lived...* We see in Chapter 6 that experimental subjects in general at most remember this much about this whole setting description. Important in the story, then, are the further events and the actions of the hero and not the description of landscapes: These are relevant only insofar as they globally specify the setting of the events or some property of the participants (here: richness). However, if the same fragment would occur in a travel guide, it would be the landscape that would be important; it could most certainly not be deleted and would require generalization at a lower level. Hence, we only know how to treat the microstructural information if we know what kind of discourse is involved and what category the information is part of.

3.3.4.   A more complex narrative example may be observed in the crime story we have analyzed in Chapter 2. Apparently, the events and actions of the

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[8] This story was used in summarization and recall experiments reported in van Dijk (1978e), van Dijk and Kintsch (1977), and Kintsch (1976).

first fragment of this story may function as the initial part of a Complication category: KH sees a pretty girl and thinks how it would be to go out with her. It soon appears, however, that this episode is merely an illustration of the general state of mind of KH (frustration), resulting from the absence of his wife. Hence, at a higher level, the first propositions, and even the first macropropositions, become generalized to Setting macropropositions like: 'KH is a bank official. He is frustrated because of the absence of his wife.' In other words, given an initial Setting category we try to delete, generalize, and construct information in such a way that macropropositions are formed that may function as background or conditions for complicating events. In our story, this Setting is formed by the macropropositions mentioned above, whereas the Complication is formed by 'KH goes to see a call girl. He likes her. She is murdered in her bedroom, when KH is waiting in the living room.' Note from this example that the schematic categories need not be filled by just one macroproposition. Thus, a complicating macroevent also requires global preconditions of that event, according to the usual event and action structure of episodes. We have argued earlier that these distinctions are not of the schematic type but belong to more general frame knowledge and other knowledge about actions and action sequences.

3.3.5.   Given the important, summary-like, role of newspaper article introductions, we know in the *Bakkelash* text that the first sentences are not merely a Setting for the rest of the article but properly the initial expression of the macrostructure of the text. Hence the first proposition is not transformed and is taken up directly in the macrostructure, as the Introduction/ Summary category. Although the discourse appears in a weekly and not in a daily newspaper, this general property of news seems to hold here as well, although sometimes such magazine political news items may also start with often 'intimate' detail, as for instance the familiar *Time* or *Newsweek* 'news stories':

> (22) Jack, a 20-year-old corporal from the Midwest, reported to the U.S. Army hospital in Landstuhl, near Heidelberg, in tears last week, "I'm all screwed up on heroin," he told the chief psychiatrist, Col. Edward Jeffer. 'I've got to go home in three months and I can't let my family see me like this." ("Europe's GI Drug Scene," *Newsweek*, July 3,1978, P. 9)

Of course, this news story is not about Jack but rather about GI drug addicts in West Germany and hence, given the title, such a fragment does not function as a regular (general) Setting. It shows a typical example, one case that is typical of a general political or social problem. Strictly speaking, then, the news story begins *'in medias res'* (viz., with a particular detail of the Complication), and we expect information about the general background

afterward, which is a normal schematic transformation. On n the other hand, if we want to interpret (22) as a fragment of the Setting, we need to delete and generalize to a macroproposition like 'U.S. Army soldiers are becoming drug addicts in West Germany.' However, this could also qualify as a Complication, given the Setting 'There are U.S. soldiers in Europe,' but in the particular text the macroproposition is indeed the Setting for political action (viz., work of a special committee reporting to President Carter).

Theoretically important for us is the result that the final schematic function of a sequence depends on the other schematic categories of the text and that therefore macrostructure formation may depend on a fully established schema. In a cognitive processing theory this of course is different: The reader going through the text in a linear fashion has to make strategical hypotheses about the functional category involved. In that case he simply follows the canonical order of the assumed schema-where the schema assumption is derived from context factors such as the kind of mass media or communication type. The hypotheses may of course be corrected afterward. In our case, for instance, the reader notices right away that the initial sentences are not the introduction/ summary category of news, because first of all it is too particular and second because such a summary should relate directly to the title of the article.

In the *Bakkelash* text it is mainly the Supreme Court's decision that is the central news item (as expressed briefly in Introduction/Summary), and we therefore also keep the 'content' of the decision and its immediate condition and consequences, but the other details are not relevant for the newspaper schema. It is typical that the text sequence following the first fragment we chose continues with the History and Background sections, a long section of Details about the arguments of the Justices, and finally an Evaluation section, running as follows:

(23)   There is much legal argument in Justice Powell's long, leading opinion. Considering the passion and resentment the issue of "reverse discrimination" has evoked, the court caused no surprise in delivering a ruling that pointed in two directions at once. ('Bakkelash," *The Economist*, July 1, 1978, p. 32)

Surprising is that this opinion of *The Economist* (or its journalist) hardly seems to fit the implied evaluation of the title.

3.3.6.   Let us now have a brief look at a different kind of text, like the scholarly paper fragment *Laboratory vs. Field Experimentation* that is also analyzed in Chapter 2. Here the Introduction nicely starts with the 'problem,' the distinction of laboratory and field experimentation, and the skepticism of doing social research in the laboratory. This general problem is therefore

assigned macrostructure relevance and not the particular consequences for the students. Unlike in narrative discourse, particular participants are not relevant in scholarly discourses of this type; reference to them is merely illustrative and will be deleted in the macrostructure. In our example the first sentence, thus, functions as the Setting of an argument. The various theses of the premises are duly backed up with results from experimental evidence, and they lead to (one) general conclusion, that actual behavior of subjects must be studied, both in the laboratory and in the field. The latter part of the conclusion is derived from the general fact that both the laboratory and the field experiments have advantages (viz., control and normal behavior, respectively) and disadvantages. Macrostructurally relevant in the fragment, thus, are those arguments (facts) of the premises that contribute to the general conclusion. Again we see that the schematic structure singles out the (macro) propositions that are most important for the text as a whole.

3.3.7.   Finally, we should have a look at an example, the *Berlitz* text, where there is no conventional schema. Advertisements may have nearly any form, and the importance of certain propositions is therefore not controlled by a conventional schema but rather by the *pragmatic* and *sociocultural functions* of the text directly. In this perspective, for instance, we know that the content of the advertisement is globally about an object, product, or service, which is (indirectly) stated to be 'good' and which is *recommended* to the reading public. The assignment of global meaning is geared toward this pragmatic   pattern of *practical argumentation: X is good, so buy/use X.* Longer advertisements specify an argument structure to show the validity or plausibility of both propositions of this pragmatic schema: They show *why* the product is good and/ or *why* one should use it, the first argument being about the quality of the product and the second about the needs, wishes, etc., of the consumer. The argument here indeed exactly follows this double argument: It is shown that the Berlitz method is good because it is natural, and second it is (though briefly) suggested that learning a foreign language by this method is good for your career. The general Setting of the argument is 'language learning.' The first fact that is stated is that early natural language learning is easy and like a play. It is then stated (as a fact) that Mr. Berlitz studied these methods and, third, that his method is derived from the natural language acquisition method. By a *comparison* operation, the quality of method is carried over to the second method, due to a common feature ('naturalness'). This is a well-known rhetorical device in argumentation. For our discussion it is important to observe that again only the major Setting and the Facts who lead to the practical conclusion are considered to be important, whereas the Warrant and its Backing are subordinated and the specific details of the lower categories are deleted: *"(he) observed people struggling through grammar books,"* which exhibits a small embedded argument (People try to

learn a foreign language. They use grammar books. They struggle doing this, so these methods are no good) which provides further backing for the first fact: It is easy to learn foreign languages in a natural way.

It follows from this brief discussion that even if some discourse types do not have, in general, a proper schematic structure, first it may he the case that the relevance of their information is controlled by pragmatic and other contextual factors or even schemata (e.g., those of rhetorical persuasion)[9] and, second, that other schemata are embedded [e.g., arguments, stories, or (quasi-)scientific demonstrations] to emphasize the important macroproposi-tions.

3.4. CONCLUSIONS AND OPEN PROBLEMS

3.4.1. In this chapter we have tried to show, more or less informally, that the derivation of macrostructures in a text may depend on so-called superstructures. Superstructures have been defined as conventionalized schemata, which provide the global 'form' for the macrostructural 'content' of a text. Superstructures consist of hierarchical sequences of categories. These categories appear to have, or to have been developed from, functional properties. First, these functions define certain relationships between propositions in a text, which also characterize the linear microstructure of texts, such as 'preparation,' 'explication,' 'specification,' contrast,' 'comparison,' or 'example.' At the global levels such functional relations hold between whole sequences of propositions and, therefore, between the macropropositions derived from these sequences. In this sense a sequence may function as the Introduction or the Conclusion of a text as a whole; for the various types of discourse all kinds of other conventional categories may develop, such as the Complication of a story. In Chapter 5 we have a closer look at the schematic structure of dialogue discourses (e.g., conversations). Besides these textual functions, the schematic categories may also have developed from or still have pragmatic, cognitive, and sociocultural functions. Thus, an Introduction is (among other things) necessary to establish the necessary presuppositions for further comprehension of the discourse. Arguments play a role in processes of persuasion, whereas

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[9] As we have stated in footnote 6, As we have stated in footnote 6, p. 117, we must neglect these and other stylistic and rhetorical devices used in discourse in general and in advertisements in particular. They do not properly belong to a theory of superstructures but to other theories of discourse. For a survey of rhetorical strategies, see the references in footnote 6 and Ueding (1976). For the strategies of advertising, see Nusser (1975) and Flader (1974). Some of this work has been preceded by analyses of processes of Persuasion in social psychology by Hovland and associates (Hovland, 1957). Relevant for our discussion is especially the fact that arguments may be given different orderings and that these may have different persuasive effects (primacy, recency).

'interesting' Complications and Resolutions in stories have a cognitive-emotional function. Finally the Introduction-Summary of the newspaper article has both a cognitive function (viz., establishing the topic of the text) and a practical communicative function [viz., to allow partial reading of the text (skimming)]. In other words, all information in a text and, hence, the macrostructures should be interpreted relative to other information in the text and relative to information of the context, both in the perspective of interdependency and in that of functionality.

It follows from this summary that superstructures further *organize* the macrostructure of a text, by assigning sequences of macropropositions to schematic categories.

3.4.2.   On the other hand, the superstructures also play a role in the formation of macrostructures themselves: They put constraints on the application of the macrorules. It may be the schema that first has certain conventional semantic restrictions. An example is the Resolution of the narrative, which must be a human (re-)action. These restrictions can only apply on *global* information and hence on macropropositions: In the Resolution section of the story there are also all kinds of different (nonaction) propositions at the local level. Hence the existence of superstructures is further justification for the theoretical and empirical relevance of semantic macrostructures.

The superstructures also determine the formation of macrostructures in another way: They define which information is important or relevant for the text as a whole. Given the description of a landscape in a story, we know that this description only may have 'Setting' relevance (viz., as background for the principal events and actions). In an argument, we focus on those facts, globally, which directly allow the derivation of a plausible conclusion or which provide an acceptable explanation. Other information, which does not have the schematic prominence of a text, hence tends to he deleted, generalized, or constructed to propositions that are functionally relevant in the schema. We later have a closer look at the various cognitive implications of all these assumptions: We may expect however that assumptions about the actual schema or schema-category provide the language user with expedient strategies in the hypothetical formation of respective text topics.

It follows, then, that the superstructures not only organize the macrostructure of a text but put *constrains* on its very formation. This may he particularly clear in certain institutional schemata (e.g., the legal ones).

3.4.3.   Although much more could and should be said about the different types of superstructures and their relations to the meaning of discourse, there are also many open problems, of which we signal only some.

A first, more general, problem is the lack of a sound descriptive, let alone theoretical, treatment of *functional relations* between propositions or sentences in discourse. The examples we have given were ad hoc, and defining the functional relations involved is not simple. Yet, such a functional analysis is important for a theory of language and discourse, and we see later that similar relations play a role in speech act and interaction sequences. Superstructures are often more specific in the sense that they represent conventionalized or institutionalized relations and categories. We think however that a superstructure theory should have a functional character, which requires a more general theory of functional relations between propositions.

For the superstructures themselves, more specific problems arise. One of the main, both theoretical and empirical, issues is the *generality* of such structures. We have analyzed some examples, but we ignore whether each particular discourse type, as ¡t is distinguished by language users, has its own schematic superstructure. In each discourse of a certain complexity, even if, ad hoc, we could distinguish something like an 'introduction' and a 'conclusion,' it is not certain that such categories would have schematic nature as long as the specific constraints on the semantic structure are unknown for that particular discourse *type*.

Superstructure schemata consist of categories. There are *formation* and *transformation rules* that define which superstructures are well-formed and which possible derived structures may appear. We have seen in some examples like the newspaper text that some categories do not have fixed places. Hence, although for some fixed schemata we may formulate rules (e.g., for narrative texts) that define something like a canonical or normal structure, we do not know the precise rules for other superstructures, let alone the acceptable transformations.

We have observed that superstructures may be partially *recursive:* narratives may be embedded in narratives, arguments in arguments or advertisements, etc. Which categories or rules are recursive is also a problem that requires empirical investigation.

It should further be noted that the use of the term *schema* does not mean that superstructures only have a fixed nature. Although we certainly have preferred or canonical orderings, the superstructures are in principle defined by (recursive) *rules* and transformations, so that there is much flexibility in the hierarchy and ordering of the categories.

3.4.4. Although superstructures have been related to global meaning structures of discourse, we have stated that they do not seem to belong to the domain of *grammar*; that is, the various categories involved require independent theories of discourse structures, of course to be systematically

mapped onto grammatical structures of discourse. Thus, a narrative theory is more or less independent and may specify which narrative structures are well-formed. Abstract argumentation forms may be specified in logical systems, and scholarly argumentation may at least in part also take place by visual demonstration. This does not mean of course that the superstructures do not closely connect to natural language meaning, as language in general interacts very closely with cognitive interpretation in general.

The exact formal links between superstructures and grammatical structures, via semantic macrostructures, are unknown. We have specified that superstructure categories and schemata operate as constraints, but we have not formulated the precise mapping rules or constraints involved.

Linguistically interesting are not only the relations between superstructures and macrostructures but also the possible surface structure and microstructural *manifestations* of superstructures in the text. It is plausible that language users identify certain superstructure categories by a number of devices. Thus, Introduction may be marked by expressions like *Let us begin with..., We'll start with,...* or with clear markers like *introduction*. The same holds for the Conclusion categories. In the psychological paper also the other categories may be explicitly marked as headings of sections.

In narrative we sometimes find Complications or major events of Complications to start with *But* or *But suddenly...,* whereas Evaluations may be marked with all kinds of expressive words like *God, Jesus, well, like hell,* etc. Conclusions and Morals may be marked with connectives like *So, Therefore* and may exhibit future tenses.

Quite another manifestation of superstructures seems trivial now (viz. , the *ordering* of sentences itself. Introductions simply come first very often, and Conclusions last, at least in canonical orderings).

Semantically, superstructures are 'visible' via macropropositions and hence also in topic changes at the microlevel: Going from a Setting to a Complication necessarily requires a different topic.

3.4.5.   We have briefly discussed the relations of superstructures with grammar. Since they are based on functional relations and pertain to the organization of the discourse as a whole, we should at least note briefly that, this kind of structure was the object of *rhetoric*. It has been classical rhetorics that, although less than for local style and rhetorical operations, had interest for the global organization of discourses, especially the public speech in court or parliament. Narrative structures have been studied, both for stories and dramas and for their role in speech. Similarly, the structures of reasoning were of course of central importance in the persuasive techniques of classical rhetorics. It is not our task here to investigate the various superstructural aspects of rhetorics.

The relations with a general theory of discourse, which is not the task of the *grammatica* nor of the *dialectica* for that matter, have initially been treated in the *rhetorica* of Greek and Roman antiquity. It is also there that we find the historical roots of both macro- and superstructural notions.

Note also that the schemata we have dealt with in this chapter are mainly of a global nature. Rhetorics has a more sophisticated treatment of local schemata however, at the level of sound, word, phrase, or sentence, such as rhyme, alliteration, and metaphor, that have been ignored in this chapter, although some of them may have a global nature as well (e.g., metaphor).

3.4.6.   Finally, some remarks are necessary already at this point about the *cognitive basis* of superstructures, whereas the various further processing assumptions are worked out in Chapter 6.

Just like any kind of general and conventional knowledge, superstructures are part of the 'semantic' memory of language users. In particular, they have sometimes been considered as examples of typical *frames* or *scripts* that define the stereotypical knowledge of language users.[10] Such a frame would then consist of the major categories and formation rules of the superstructural schemata. We have, however, some doubts about this frame-like nature of superstructures. Not only are they very much different from the 'real-life' examples for frames, such as 'eating in a restaurant' or 'going to the movies,' but also they may be much more implicit than the traditional knowledge about social episodes. Certainly, in stories we know what might come next, when a story is finished, and that it should go on after a Complication. But in frame instantiations this knowledge and predictions are different: Participants know *what* may or should happen next, but this is not always the case in discourse: The *form* may be known (sometimes, at least implicitly) but not the content, because it is, by definition, at least partly new, except for standardized plots (princess-prince-dragon, James Bond, etc.).

Of course, this argument depends on our conception of frame-like knowledge organization, which we discuss later. However, we reserve the notion of frame (or script) for knowledge about stereotyped social *episodes.* If we would admit the notion of 'frame' for superstructural schemata as well, there would be hard1y any reason not to accept it as well for the syntactic structures of sentences and hence for all kinds of conventional knowledge about information structures. As soon as the frame notion is widened to this extent, it looses much of its theoretical attractiveness, because it would soon encompass (general) knowledge *tout court* and be reduced to a conceptual organization principle in general.

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[10] Superstructure schemata (e.g., of stories) have been taken as examples of frames or scripts by Minsky (1975) and those who have been inspired by his paper.

It should be admitted, however, that the boundaries are not always clear. Thus, superstructure schemata are closely linked, we suggest, with pragmatic and interactional schemata: for instance, an argument with an argumentative dialogue ('arguing', etc.). Such interactions in sequences may become, stereotyped, as for instance the development of a meeting, which in that case would require a knowledge frame. Also meetings are 'opened' and 'closed' and hence have a 'superstructure.' This means that we may have transitions from frame knowledge to language and communication knowledge that are not 'frame-like' but more strictly rule-based and not always consciously, controllable. In any case we give this problem more attention in Chapter 6.

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4 Macrostructures in Action and Interaction

4.1. INTRODUCTION: AIMS AND PROBLEMS

4.1.1.   In this chapter we study global structures in action and interaction. We proceed along similar lines as we have done for discourse. This parallelism, as we will see on several occasions, is not arbitrary. Action, just like discourse, may be described in terms of 'expressions' which have conventional meanings and which, therefore, require interpretation. Similarly, activity may take the form of *sequences of actions*. It is argued that such action sequences, much like sentence sequences, are both locally and globally *coherent* and that, therefore, we should also describe them in terms of *macrostructures*. Finally, it also appears that there are direct relationships between discourse and action: First, the use of language and discourse in communicative situations is normally a specific kind of social interaction, performed by what we call *speech acts*. Such speech acts also occur in sequences and these also organize in macrostructures, which are given special attention in Chapter 5. Another link between action and discourse shows in *action descriptions* (e.g., stories). We assume that insight into the structure of action and action sequences enhances our understanding of the organization of discourse; conversely, we can learn much about the nature of action by studying the ways people talk about action. This is in line with our more general methodological point of view, which not only takes abstract analysis as its point of departure but also takes into account the various categories used by social participants in the various contexts of interaction, including those of speech interaction.

4.1.2.   The global analysis of action and interaction sequences that we undertake in this chapter in principle has a more or less *independent* character. Later, in Chapter 6, it is shown that an important aspect of complex (inter-)action is *cognitive* (viz., the motivations, purposes, and intentions of action). Similarly, it is not possible to understand complex action without the usual set of knowledge and beliefs. This would be reason enough to treat action within a cognitive theory.

At least provisionally, however, we do not follow this route. Much in the same way as language and discourse, and especially their meaning and hence macrostructures, are cognitively based and are nevertheless studied in abstraction from the cognitive *processes* involved (viz., within linguistic grammars or theories of discourse), we would prefer to study action and interaction first within the more abstract framework of a *theory of action*. A theory of action, then, uses various theoretical terms which, as such, are primitives in the theory but which of course require a cognitive foundation. It is especially the cognitive common basis that makes clear the close relationships between global interpretations of discourse and global interpretations of (inter-)action.

4.1.3.   In this chapter we are not interested in the notion of action in general but limit ourselves mainly to *complex social interaction*. Of course, complex social interaction theoretically, is defined in terms of action, but we prefer to apply the notion of macrostructure in the domain of social interaction. This is (1)because of the links with language and discourse, also taken as forms of social interaction; (2) because we want to arrive at a macrostructural treatment of speech act sequences and conversation (Chapter 5); and (3) because we think that current theory of action (e.g., in philosophy) has neglected the study of more complex forms of action and, especially interaction. Whereas Chapter 2 deals with problems of linguistics, this chapter therefore deals with some fundamental aspects of the *social sciences,* especially *sociology*. These two disciplines then meet in Chapter 5, where different forms of linguistic interaction are studied, and again in Chapter 6, where the common cognitive aspects of discourse and action are discussed.

Although it is certainly possible to give an abstract account of action, within *philosophy*, just as we have a philosophy of language and a philosophy of meaning and reference, we would prefer to localize the *empirical study of (inter-)action* within the social sciences, in much the same way as the empirical study of language and discourse belong to the fie1ds of linguistics and discourse studies. In other words, our analysis of macrostructures in interaction in this chapter is meant as a contribution to both the (philosophical) theory of action and the social theory of (inter)action. These social aspects of the theory appear in the brief systematic account of the structures of the *social context* in which interactions occur.

4.1.4.   Since both the philosophical and the social theories of action and interaction are very extensive, we must limit ourselves to *complex (inter) action* and in particular to the structures of *(inter-)action sequences*. But even the precise local structures of interaction sequence cannot be gone into too deeply here. We focus on the *global structures* of sequences of (inter-) action. Our aim is to study how such complex forms of behavior are *organized*, both in social and in cognitive terms. The questions we are confronted with are like the following: How do people *plan, execute,* and *control* complex interaction? How do they *observe, understand* or *interpret, process,* and *memorize* complex interaction? What is the *social role* of such global interpretations of interaction? How does knowledge of social structures in turn influence these processes of global planning and understanding? Finally, how does the global organization of interaction show in behavior, e.g., in discourse about action?

Hence, we attempt to develop some further ideas about the macrostructural organization of action and interaction. Such assumptions, as we suggested, must have a clear goal. Except for insight into the notion of action and interaction per se (e. g., by showing first that the global analysis of action will shed some light on the local structures and connections of action), we hope to provide some further understanding of the foundations of sociology. Next our analysis may be fruitful for the linguistic study of speech act sequences and conversation. Finally, we hope that the global theory of interaction also has direct cognitive plausibility, by providing the basic abstract principles also operating in planning, execution, and understanding of complex interaction. The latter link is perhaps obvious or even trivial, when we realize that our abstract theory of interaction has a strong cognitive dimension. After all, macrostructures, both in discourse and in interaction, do not show directly; we cannot 'observe' them but must assume their 'existence' as parts of the meaning or *conceptual* structures of discourse and behavior, which makes a cognitive approach to both discourse and interaction a necessary component.

4.1.5.   In order to be less abstract about the specific problems of this chapter, let us give some examples. Let us assume, taking the example of the previous chapters again, that somebody has to make a trip by train to some town. This is certainly a complex action, consisting of a sequence of actions and interactions in which other people are involved. First, we want to know why we are able and usually do 'take' this sequence of actions as a *whole,* a *coherent unit* for which we have a specific concept. In other words, certain sequences of action appear to be organized also at a *higher level*. We want to see whether this is a necessary aspect of sequences of action in general or only for specific types of sequences. In the latter case we want to know how complex behavior is organized if not by such global conceptual structures

that we have called macrostructures. Just as macrostructures allowed us to define the global coherence of discourses, and hence to make a differentiation between different discourses in our everyday communicative interaction, we must see whether macrostructures of action allow us to *chunk* behavioral sequences into discrete (global) actions. Why is 'eating in a restaurant,' 'taking a train,' and even 'studying psychology' a complex action unit, and 'buying records and drinking a beer afterward' or 'watering the plants in the garden and taking a shower afterward' not such a conventionally known and recognizable action unit? Without a sort of global notion it is extremely difficult, if not impossible, to distinguish larger units or higher levels in the sequences of (inter-)actions of social participants. And yet, these social participants themselves do operate such interpretative distinctions: Although they are nearly constantly actively or passively involved in all kinds of activities, they perceive, understand, and further process such activities in discrete local and global actions. Depending on a number of factors, they sometimes 'see' somebody asking for a ticket or only buying a ticket or even just taking a train or taking a vacation. Hence, language users and social participants, in general, chunk and organize, both in planning and interpretation, their everyday activities at different levels and in different unit sizes. We want to know how and why they do this and how assumed macrostructures of action are involved in such an account. Of these questions this chapter only considers the action-theoretical dimension, leaving (as said before) the cognitive basis of them for later analysis.

4.2   THE STRUCTURES OF ACTION

4.2.1.   To understand the global organization of interaction and the notion of 'global action,' it is necessary to understand the notion of *action* in general. For the details of both philosophical and social analyses of action, limitations of space force us to refer to other work.[1] Since many of the concepts used later

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[1] Some of our other work gives introductions to the theory of action; see van Dijk (1977a). Here and elsewhere we are indebted to work by von Wright (1963, 1967), Davidson (1967), Brennenstuhl (1974), and many others –both linguists and philosophers. For complex action we especially should refer to Rehbein (1977), which is probably the most extensive treatment of this topic. For all kinds of detail about many topics briefly discussed in this chapter, also the links between action and discourse, the reader is referred to that book. For general introduction and reading in the domain of action theory, see Rescher (1967); White (1968); Care and Landesman (1968); Binkley, Bronaugh, and Marras (1971); and Danto (1973).

We are aware of the fact that (e.g., in the problem-solving literature) also various kinds of notions for action sequences have been used (goals, subgoals, etc.), but the distinctions and definitions made there are not always sufficiently explicit (see Newell & Simon, 1972, for further references). Important in that literature is especially the account of *strategies* of reaching certain goals. Such strategies are discussed in Chapter 6.

in this chapter have a rather precise technical meaning, we briefly summarize the major issues and concepts of a general theory of action:

1. Actions are abstractions from *activity* sequences ('behavior').
2. Actions manifest themselves as (overt) *doings*.
3. Doings are units of human activity that are assigned *action concepts*; hence actions are *intensional* units, results of the *action interpretation* of human activity.
4. Doings are a specific kind of (bodily) *events*.
5. Events are discrete changes in possible worlds (and time).
6. Doings may be interpreted as actions if they are *controllable* and executed by a *person* who is *aware* and *conscious* of its doings.
7. Doings are not simply 'caused' by the persons executing them but rather the final manifestation of a complex process of which the first stages are *mental.*
8. A doing can be interpreted as an action if and only if it is linked to (controlled by) an *intention* of a person.
9. Doings may have various stages, of which the final state is called the *result.*
10. If a result of a doing comes about according to the intention of the doing person (the *agent*), the action thereby performed is called *(weakly) successful.*
11. Actions are usually performed in order to change the possible world of the *action context* (e.g., by causing events or other actions, which are consequences of action or *goals*).
12. Consequences of action are mentally represented as *purposes*. Purposes underlie or determine intentions.
13. If goals that are caused by intended doings (action) are realized according to purpose (or aim), the action is called *(strongly) successful.*
14. Purposes and their embedded intentions are the final stages of a *decision* process in which several stages and conditions are involved: needs, wants, wishes, etc., as *motivations*, and knowledge, beliefs, abilities, etc., as *conditions* that are generally *controlled* by values, norms, and attitudes, together defining the *cognitive set* of an agent in some action context.
15. *Action contexts* must satisfy a number of (external) conditions that allow actions to be performed and have their purported goals.
16. Whereas positive actions are actions which are manifested by doings, *negative action* (forbearance, letting, etc.) is defined in terms of nonexecuted doings which in similar alternative contexts would be expected, normal, obligatory, etc. In that case nondoing (which is doing something else instead) must as such be intended.

4.2.2. It goes without saying that this list is far from complete, and it does not give appropriate definitions of the various concepts involved. Nearly all of them would, and sometimes did, require book-length treatment, and philosophical and empirical problems abound. Some of the underlying cognitive stages of action are discussed later, but it should be recalled here that notions such as 'intention' are far from clear also in a cognitive model. The same holds for the precise process of action 'generation': How precisely wishes, wants, or preferences interact with previous beliefs about the action context and how more general systems control this decision process is still obscure. The abstract theory of action, then, only explicates some of the main concepts involved in the identification, delimitation, successfulness, etc., of action as interpretation units of human activity.

4.3. ACTION SEQUENCES

4.3.1. Although we have only summarized some main properties of action and ignored a great number of problems and controversies in action theory, we now proceed to the analysis of *complex action,* of *action sequences* and *interaction*. If further theoretical notions are necessary, we introduce them along the way.

We have started the analysis of action by pointing out that it is abstracted from sequences of activities of agents. Thus, we assume that, as long as agents are conscious, etc., they permanently *do* something and thereby perform positive or negative actions. Sometimes they accomplish *several actions at the same time*, although in that case only a limited number of actions are under direct control (e.g., talking with someone while pouring some beer in one's glass, whereas other actions are only under marginal control: standing up while doing this, looking at somebody, exhibiting facial expressions, etc.). Similarly, we may accomplish a *series* of actions, one after the other or more or less overlapping. Sometimes these actions are related to each other (e.g., *conditionally*); sometimes this is not the case. If I take a book to read in it, the actions are related; whereas if I take a book and then light a pipe, the actions may not be or are only indirectly related. Except by *temporal* succession, actions may thus be *ordered* by certain relations. These ordering relations, as we have seen earlier, are often of the conditional type: One action is a condition of a following action. There are various kinds of conditional relations. First they can be defined *forward* or *backward*. Forward conditioning says something about the *consequences* a given action may have, whereas backward conditioning says something about the *preconditions* of a given action. Both types have different *strength* or *strictness,* terms that come from the (modal) logical study of connectives. Thus, conditioning, both ways, may be *necessary, probable* (likely), or just

possible. Thus, we have necessary, probable, and possible (pre-) conditions and necessary, probable, and possible consequences. Smoking a cigarette requires as a necessary condition that the cigarette be lighted, whereas falling in the river has a possible condition that one will drown. The definition of these terms, given the set- of physical, biological, etc., postulates of sets of possible wor1ds, may be given in terms of probabilities, ranging from 0 to 1, or in the more abstract and 'discrete' terms of quantifiers such as 'at least one,' 'at least one not' ('not all'), and 'all,' applying to the set of possible wor1ds or rather the set of *courses of action* of which the action sequence is a part. An action sequence is *connected* if for each action of the sequence there is at least one other action that is a precondition or a consequence of that action.

4.3.2.   Connection is only one of the factors that make action sequences *coherent*. First, the connection definition allows action sequences to consist of connected action *pairs*, which are not themselves conditionally related. A stricter definition would require each action to be a consequence of an action and at the same time a condition for a following action, except of course for the first and the last actions of the sequence. In that case we speak of *strict (linear) connection*.

Second, actions may also be related in other ways. Thus, if *A* causes *B*, and *B* causes *C*, we have a (strictly) connected sequence, but such a sequence need not be coherent according to certain intuitive criteria. For instance, *A* and *C* may have nothing to do with each other, so that the sequence would be an *arbitrary* causal sequence. Thus if I buy a book, and the book seller thereby acquires some money, with which he buys himself a ticket for the theater, the sequence may well be connected, but it would be a more or less arbitrary sequence of actions: Buying my book has nothing to do with his buying a ticket. Especially if such sequences are still longer, the connection chain may go completely 'wild.' It is more interesting to speak about certain action sequences if these satisfy some further coherence conditions that define them as a 'unit,' an *episode* of which each action(or event) somehow has more than conditional relations with another and where such an action has a particular *function* in the whole episode.

To establish coherence in other ways is to keep *place* and / or *period* more or less identical or to let these change under certain conditions (e.g., as a function of the actions of the same participant).

We immediately come to a next constraint here: Keep a (limited) number of *participants constant* for at least a subsequence of actions. Sequences of actions that are merely connected may in principle have new participants in each subsequent action. In coherent sequences there are one, two, or a small group of participants that are involved in most of the actions of the sequence.

Finally, for a sequence to be coherent not only the actions should be connected but they should also be *conceptually* related: Not wanting to read a

linguistics book this afternoon may be a reason for going fishing, which is a necessary condition for the possible consequence of catching a fish, which may have my eating fish for dinner as a possible consequence. Yet, not wanting to study linguistics and having fish for supper are not conceptually related. In terms of the coherence conditions for discourse, we would say that they belong to different *topics* or *themes*. Hence, there must be a *global* constraint that makes action sequences coherent, and it is at this point where we need *macrostructures of action*, to which we turn shortly.

4.3.3. Even at the *local* level however we can introduce more structure into the action sequence. In strictly connected sequences, the successfulness conditions of an action Ai must have the final state or result of the previous action $Ai-1$ as a subset: To smoke a pipe, I must light it, but only if the intended result of the lighting action obtains (the pipe is burning) can I successfully accomplish the action of smoking ¡t. Given the action sequence accomplished by one agent, this condition may be formulated in a more restricted way by requiring that the first action is accomplished *in order* for the second action to be performable. According to our earlier definitions this means that Ai is the goal of $Ai-1$, or, in other words, the agent has a representation of Ai, viz., the purpose of accomplishing Ai, with which also the action $Ai-1$ is intended and executed. This purpose may pertain not only to the whole following action but also to its final state (result). And that would mean that the intention of Ai [which we may write as $I(Ai)$], which strictly speaking would be formed only if $Ai-1$ is successful, is part of the purpose of $Ai-1$ [viz., $P(Ai-1,)$]. In this case the agent must know or believe that the result of $Ai-1$ is a possible condition for Ai (or even a probable or necessary condition). Thus, 1 may buy a book to read that book, whereby my intention to read the book is already part of the purpose of buying ¡t. This situation may hold for a whole sequence of actions: They are all performed by an agent with the purpose of realizing a goal that is the result (or the consequence) of the last action of the sequence. So, for the sequence as a *whole* there is a *constant purpose*, whereas for each action of the sequence ¡t holds that ¡t has the purpose of allowing the accomplishment of the next action. Hence, we apparently have a distinction between *local* and *global purposes* in action sequences, where global purposes probably should be made explicit in terms of macrostructures of action.

However, the picture is still more complex. There is not only a distinction between local and global purposes and goals. Global purposes and goals pertain to sequence taken as a whole. Thus one goal of building a house may be to live in it. Yet, this goal is not a consequence of the final action of the sequence of actions that constitutes the building of the house but rather the consequence of the 'global' action of building a house. Thus, if we accomplish a sequence of actions to realize the goal that is the consequence of the last action, strictly speaking we are still at the local or *linear* level. Leaving the

global analysis of action for Section 4.7, we first have to look at the purpose-intention-result-goal structure of sequences. To denote the goal that is the consequence of the last action of a sequence, we speak of a *sequential goal*. A sequential goal however is not *merely* the goal of the final action of the sequence but also, indirectly, the goal of the previous actions of the sequence, because these actions are performed to allow the accomplishment of an action of the goal wanted. Hence sequential goals give an *orientation* to a sequence of actions. This orientation gives a further coherence dimension to the sequence. Since we now already have a rather complex set of coherence conditions for action sequences, let us first summarize them: Given a sequence of actions:

$A = (A1, A2, ..., An)$

(a) *Local connection*
   For each Ai there is an action Aj such that Ai is a (possible, probable, necessary) condition of Aj (and Aj is a consequence of Ai).
(b) *Strict local connection*
   For each Ai $(i > 1)$, there is an action $Ai+1$, such that $Ai+1$ is a consequence of $Ai,$ and there is an action $Ai-1$ such that Ai is a consequence of $Ai-1$ *(and idem with 'condition,' for $i < n$).*
(c) *(Strict) local coherence*
   For each $Ai-1$, Ai, $Ai+1$ that are connected, there is at least one same place and/ or time period and at least one same participant agent involved in $Ai-1$, Ai, $Ai+1$1.
(d) *Local orientation*
   For each $Ai-1$, Ai, $Ai+1,$ which are locally coherent, $Ai = G$ $(Ai-1)$ and $Ai+1 = G(Ai)$ [where $G(Ai)$ is an abbreviation for 'the goal of Ai'].
(e) *Sequential orientation*
   For each $Ai-1$, Ai, $Ai+1,$ which are locally oriented, G $(An)E$ $G(Ai)$, for $i < n$.

Other formulations and further restrictions are possible. For instance we have not included in (d) and (e) the condition that the actions are being accomplished by the same agent. But, we might also call a sequence of actions oriented if someone accomplished an action with the goal that someone else accomplishes an action (which is a consequence of the first action). It may be the case that (c) is too strong, but at the moment we have not yet another condition for local coherence. Further coherence will appear to be global and be explained in macrostructures of actions later. Finally, instead of taking orientation in terms of goals of (subsequent) actions, we may also take results and, hence, intentions as the orientation basis. Theoretically, however, a goal may be identical with a result (e.g., when we accomplish an action merely to realize the result of that action), so no alternative formulation is needed.

There are a number of further complications. First, it should be stressed that it is quite possible that, given the outcome of certain actions of a sequence, the ultimate goal is no longer realizable. In that case, the agent may give up the action sequence toward this goal and/or establish a new goal, which also determines the respective purposes of the actions in the sequence. Theoretically, however, this possibility requires the same kind of formulation as given previously. Differences appear at the cognitive level, where strategies for sequence changes, including goal change, can be formulated.

Theoretically more crucial, however, is the possibility of *alternative sequences* having the same goal. Above, the conditions were formulated for a given sequence, abstracted from the much more complex course of activities. Clearly, it may be the case that alternative action sequences may lead to the same goal. This means that the sequences involved can be defined in terms of identical (partial) purposes, both locally and sequentially.

Both possibilities (viz., setting up new goals and alternative ways to reach the goal) guarantee the necessary flexibility. Not only in action sequences of individual agents but especially in interaction, it is frequently the case that during the execution certain intended results or local goals cannot be realized, because an agent never knows for sure what his coagents will do next. We return to this aspect of interaction later.

4.3.4. Until now we have specified some of the conditions for the coherence of action sequences. These conditions and the structure they define in the sequence are however only *linear*. Sequences may also be assigned *hierarchical* structure, in a way that is similar to that of complex sentences or sentence sequences.

The intuitive idea here is that some actions of the sequence are more 'important' than other actions, so that we may speak of *superordinate* and *subordinate* actions as soon as some action in fact is part of or in another way at a lower rank than another action. Thus, in a sequence of actions involved in 'going to the movies,' the action of looking at the movie seems more important than buying the ticket or walking to one's seat. Although this importance, relevance, or prominence, as we saw in Chapter 2, also requires explanation in terms of macrostructures (so that buying a ticket is more important than taking one's purse in order to pay for the ticket), there are also local differences in 'rank' between subsequent actions of the actual sequence. It is, however, far from easy to define such hierarchical relationships. Superficially speaking, a sequence of actions shows in a *sequence of doings*. At that level the relative importance of actions cannot be properly defined: Doings as such are all of the same 'rank.' It is the interpretation of these doings that may assign differences of rank level, or importance. This assignment of relative importance first may he based on the respective *functions* of the actions in the sequence. Thus, certain actions are *necessary* in

a sequence to realize the sequential goal. Other actions are *possible* or *probable* ways to reach this goal but may also be absent or be substituted by others. In the action sequence of 'buying bread' it is necessary that I order the bread, pay for it, and especially take the bread. How I go to the baker's, whether I buy the bread in a supermarket or not, how I ask for the bread, and all other actions may be optional or free variations. In that case, necessity may be required at another level: I must of course 'go to' the shop, but the way I go there is a free variation. This kind of relevance differences, hence, is formulated in terms of *goal- or result-dependence* of the sequence.

A more general way of defining importance of actions may be given in terms of their *consequence set*, although there are intricate theoretical problems involved. In this perspective an action is more important if its set of *alternative consequences* is larger. This means that if the action does *not* occur in the sequence, more events or actions also change (or are not possible) in the sequence. Thus, whether or not I read a newspaper on the plane hard1y effects my travel, but coming to the airport in time and checking in are important actions because if they do not occur the consequences are such that the whole action of traveling may change, and 1 may not reach my goal or may have to resort to alternative sequences of actions to reach my goal. The definition also holds the other way: Actions that perhaps as such, in a given course of action, would not be important, Eke lighting a cigarette, may become of crucial importance given the specific consequences (e.g., if a gas explosion or a fire are the consequence of my action).

Consequences, however, should be measured not only in quantitative terms but also in *qualitative* terms: 'Small' actions may well have many consequences, but these consequences may each again be rather unimportant. One very important action may follow, which would make the conditional action also very important. In that case importance should perhaps be defined in terms of the degree in which *(highly) preferred goals* are reached or not. One of the highest 'life goals,' for instance, is to stay healthy and alive. Any action or event that would affect or even annul the possibility of reaching this goal (or keeping such a state) would therefore be more important. At a more modest level, being able to buy a ticket for the movies is more important than being able to buy sweets, because if the tickets are sold out, 1 may not be able to realize a high1y preferred goal (viz., seeing a particular movie). Importance is therefore relative and hierarchical due to the hierarchy of goals.

Finally, the hierarchical relation between actions in action sequences may play a role for what may be called *auxiliary actions*. Although such actions very often occur in interaction sequences, we may also define them for action in general. Intuitively, an action is called auxiliary if it is accomplished merely to make another action successful. In a sequence this may mean that it allows the performance of just one component action of the sequence. If that component is necessary and if the auxiliary action is also necessary, then the

auxiliary action is of course *indirectly* important for the sequence, because without it the sequential goal would be unattainable. One of the differences with the proper 'main' component actions of a sequence is that the goal of the auxiliary action is *merely* the establishment of the conditions for allowing another action. Hence, the sequential goal need not be 'part of' the local goal (by embedded purposes). Typical of auxiliary actions is also that *any* action that has the required results establishing the conditions for accomplishing a main action is possible.

Closely related to the notion of auxiliary action is that of *preparatory action*. One of the differences is that the auxiliary action is counted as part of the sequence, whereas a preparatory action is any action that has as its goal the establishment of the *necessary conditions* for allowing a specific action sequence and therefore falls outside the sequence.

4.4. INTERACTION AND INTERACTION SEQUENCES

4.4.1. Although much of what has been said previously also applies to *interaction* and *interaction sequences*, there are a great number of additional aspects and problems that require our attention. In general it may be said that interaction theory has received much less attention from the philosophy of action, although of course it has been extensively treated in the social sciences.

The crucial additional aspect is of course the involvement in the action or action sequence of more than one person. From a socioeconomic point of view and given the properties of socialization it may even be said that action in general is learned and executed with or in relation to other social participants and that, therefore, the basic form of human activities is interaction and not individual action. Interaction may take several forms, first depending on the roles of the persons involved. In *one-sided interaction* we may have several persons, but only one acts as agent; the others act as 'patients' of the action: They merely undergo the action. Being a patient requires however that the patient is aware of the action and interprets the doing as a certain action -where of course the assigned intention need not be the same as that of the agent. A minimal form of *cooperation* may even be necessary in the sense that a patient in principle, given certain action conditions, is able to refuse to undergo the action.

In *two-sided interaction* we have an action sequence such that at least two agents are involved in the actions. Several possibilities are given here: The actions are performed together or individually. In coaction the coagents each execute their own doings, which however must be *coordinated* such that they may be interpreted as one (common) action. Although the results intended by

the coagents may be the same, this need not be the case for the goals: The agents may have different wishes and hence different motivations and purposes for the common action. In interaction sequences agents may alternatively perform the subsequent actions of the interaction sequence. Such interaction sequences may in principle have the same *coherence* constraints as those formulated previously for actions in general; that is, the respective actions of the agents are not *arbitrary* but are related to each other. In principle this means first that the results of each action of an agent *a* function as the input conditions for the action of agent *b*. In particular, agent *a* may exhibit his purpose to reach a certain goal (viz., a particular action of the other agent). *Full cooperation* is given in such a case if each of the actions of *a* contribute to the realization of the goals of *b* and vice versa. Of course, this kind of 'ideal' interaction seldom obtains, given the differences in needs, wishes, and hence motivations and goals of different persons.

Noncooperation obtains in an interaction sequence if none of the actions is performed with the goal of realizing at least partially one of the goals of the other agent, or even more strictly, if none of the actions is conditioned by the actions of the other. In the latter case we no longer seem to have a form of interaction.

Counteraction is a form of interaction in which the goal of at least one of the agents is to realize a situation where actions of the other are no longer successful (from the point of view of the other) and where therefore the results or goals are opposite.

Agents need not interact during the whole sequence of actions in which they are engaged: When two action sequences are 'crossing,' we may have common local goals, but the ultimate goals of the agents may be different (e. g., when I buy a train ticket and when the agent at the station sells it to me).

This kind of interaction may take a specific form in *auxiliary interaction*, already briefly mentioned previously. In that case, one of the agents performs actions that only have as their goal the successfulness of the actions of the other agent. In that case the helping agent need not know or share the sequential goals of the other. As a typical example, I help somebody find his way by telling him, upon request, where some street is.

4.4.2. One of the most complex properties of successful interaction is the underlying *cognitive* structure. To be able to participate in interaction, the agents not only must have their own motivation, decide upon their own actions, develop concrete purposes, and construct adequate intentions, but at the same time they must make hypotheses about those properties of other agents. First this is necessary to *interpret* the doings of the other agent as certain actions (viz., by assigning conventionally warranted or contextually obvious intentions and purposes to the other agent). Second, the agent must take into account this complex set of cognitive preconditions of the other

agents in the decision-making process determining his own actions. Important in that case is the ability of reliably predicting the likely (re)actions of the other agent as consequences of one's own actions. Besides knowledge, and expectations about the context of action, and general knowledge about reaction patterns ('if I hit somebody, he will be angry,' etc.), knowledge or beliefs about the cognitive set (beliefs, attitudes, interests, goals, values, etc.) of the other agent are necessary.

A number of these cognitive properties belong of course in a cognitive theory of (inter-)action. The question is what the more abstract and general cognitive aspects (viz., as part of the successfulness conditions of interactions) may be.

4.5. MACROSTRUCTURES OF (INTER-)ACTION

4.5.1. After these general preliminaries about the major principles of action and interaction sequences, we may now further focus our attention on the various *macrostructural* aspects of action and interaction. It should be stressed again that we have by no means covered all the intricacies of action but that cannot be the aim of this chapter. Our main point is to show that action and interaction sequences are also organized at a macrostructural level and that the production, execution, interpretation, and description of action sequences is not possible without a macrostructural component of some kind. It appears that many of the apparently 'simple' properties of action encountered previously really require reformulation in terms of macrostructures. After the more theoretical account of macrostructures in (inter-)action sequences we illustrate our assumptions by having a closer look at some aspects of social interaction sequences in a number of typical contexts.

4.5.2. *Why* do we want to characterize macrostructures of action? What are the theoretical and, above all, the empirical facts that make such a notion plausible or even necessary9 To give an answer to these questions we first must have a look at the intuitive data that social participants themselves supply about the presence of global structures of action and interaction, much in the same way as we do for discourse in Chapter 2.

One of the major reasons for introducing global structures of action is the ability of agents/observers to *take* sequences of action as *one action*. This kind of *global interpretation* of action sequences especially exhibits in action description:

(1) I took a plane to Mexico.
(2) Peter left his wife.

(3) Harry studied linguistics.
(4) Sue married Henry.

In these few simple examples we see that language users are able to report about the actions of themselves and others in such a way that the action concepts expressed denote an action that consists of a sequence of *component* actions. To take a plane, to divorce, to study linguistics, and to marry someone are all rather complex actions, in which other agents, all kinds of subsequences of actions, and hence subgoals, are involved. Yet, information processing and communication are such that it is necessary to represent such a sequence as one *global action*. This means that we *compose* a global interpretation on the basis of interpretations of the respective parts of the sequence. According to the theory of action it also means that we assume a *global intention* and a *global purpose* and hence a *global result* and a *global goal*.

That this kind of global representation of action is not a marginal phenomenon may be concluded from the fact that we know the global action concepts and that we have special words for them. Our language, thus, enables us to interpret and represent action at several levels of *specificity* and *generality*. In description this means that only the global information is relevant in a specific communicative context. If necessary, details can then be inferred from the general concept, given the usual *knowledge frames* we have about action; we return to this later.

It should be noted also that in fact *most* of our action concepts involve global concepts denoting complex actions. Even such rather low-level action concepts as eating, drinking, and cashing a check involve sequences of actions. Hence global concepts are fundamental in the *organization* of action and interaction.

Besides the internal organization of action sequences, global action allows us to distinguish *discrete sequences* in the continuous 'stream' or human behavior. At the local level it is not always possible to determine when a sequence ends and where the next one begins. The global concept, thus, allows us to delimit sequences. Given a certain sequence, the mere observation of only some of its actions allows us to infer that some global action is being performed. In a theoretical account of global action we therefore have to specify how global action concepts may be derived from action sequences.

4.5.3.   The global interpretation of action sequences is possible due to the *conceptual* nature of actions: We have seen that doings as such are not actions but rather doings associated with complex cognitive acts or states of mind. In the same way as we defined macrostructures of discourse only at the semantic level, we are able to account for macrostructures of action only in terms of

conceptual structures. In other words, if global actions organize our activities, they do so only *via* the respective actions and not on the basis of the respective doings of sequences. Thus, the 'overt' form of global action are the respective doings of the component actions. Conversely, we do not go directly from a sequence of doings to a global action concept but first must interpret the respective doings as actions, which we then may further interpret as properties of global actions. Of course, in certain cognitive strategies, shortcuts are possible in the interpretation process.

The global structure of action sequences should be accounted for not only in terms of *semantic* macrostructures, however, but also in terms of *schematic structures* as we have done for discourse as well. The schematic structure is based on the specific *functions* of global actions in the sequence. Such schematic structures may as such also be *conventionalized* or even *institutionalized* and assign preferred or necessary *ordering, hierarchies,* and *categories* to (global) action structures. We deal with these schematic structures in subsection 4.7.3.

4.5.4. The macroanalysis of action sequences can be given from different *points of view*, at different *levels*, and with a different *focus*.

The *points of view* may be that of the agent, that of a participating coagent, that of an observing social participant, that of the observing social scientist, that of an observer/ describer, that of a hearer/ reader of action discourse, etc. In this chapter our analysis, as we have stipulated, is more or less abstract, and hence the analysis is given from the point of view of theoretical description. In Chapter 6 we take into account the specific cognitive differences between action processing in agents and patients or observers. Here we are involved in a theoretical reconstruction of the basic principles of *action representation*, which may be representations in agents (viz., as *plans*) and those in coagents or observers (viz., as reconstructed plans). How such plans are formed, executed, changed, etc., is a problem that is discussed later.

Macrostructures as we have seen before are intimately related to the notion of *level* (e.g., level of description, level of representation, or level of interpretation). There is not one macrolevel but a whole series, depending on the abstraction level of the macrorules, which are recursively applicable. In a theoretical and a cognitive approach it may be relevant to start at the 'bottom' level, that of so-called *basic actions.* It may however be the case that the social dimension of action and interpretation requires a macroanalysis which at least begins at a level of socially relevant (inter-)actions which. need not always coincide with that of basic actions.

The *focus* of macroanalysis pertains to the specific properties, phases, or components of action we would like to analyze. It has been argued previously that the execution of actions by means of a series of doings would not be the right focus of analysis. The intensional nature of action would require the

analysis of the conceptual aspects of action sequences, such as the *representations* of action in the agent, coagent, or observer, in the form of *plans*. Although there is of course also a theoretical difference between synthesis and analysis models of understanding, the macroanalysis of action representation at first abstracts from such differences (viz., from the fact that an agent constructs a global plan and then specifies this plan by the formation of more particular local intentions), whereas the observer must interpret local doings as local intentions, from which a global representation can be constructed. In this respect we provisionally follow the abstract tradition that also characterizes the linguistic description of meaning. Processing differences in synthesis and analysis models are reserved for the cognitive theory of action in Chapter 6.

4.5.5.   A first aspect of the macroanalysis of action regards not only action sequences but also individual actions, viz., the *interpretation level*. To illustrate which problem is involved here, let us offer an example. First we give an approximate doing description and then a number of action descriptions that are verbalizations of the possible interpretations of such a doing:

> (5) *Doing description*
> Somebody is sitting at a table and is holding a pen with which he (she) produces some lines at the bottom of a printed document.
> (6) *Action descriptions*
> (a) He is sitting at a table.
> (b) He is holding a pen.
> (c) He is making lines on a paper.
> (d) He is writing his name.
> (e) He is signing a document.
> (f) He is buying a house.
> (g) He is making his children happy.
> (h) He is making the real-estate agent rich.
> (i) He is doing a stupid thing.
> (j) He is realizing his big dream.
>   etc.

We see that a relatively simple doing may already he assigned many action interpretations. Such interpretations are of different kinds. In (6, a-c) we have descriptions of more or less basic actions, that is, direct action interpretations of the doings, taken as minimal units that can he or are usually done intentionally, which are controllable if necessary, which are repeatable, and which cognitively may function as lower-bound observation units. We do not claim that this gives the satisfactory account of the philosophically intricate

notion of 'basic action,' but the notions mentioned are in general part of such an account. Below that level we make subdivisions of doings only in very particular cases and hence make more refined action interpretations (having one's arm in a specific position, seizing an object in a particular way, etc.). We assume that any observer knowing the objects involved (table, pen) and knowing the elementary actions humans can perform can interpret the action by the action representations expressed in (6, a-c). This basic action interpretation may well be *partial*. We may answer the question *What is he doing?* with a sentence like *He is holding a pen*. In that case only one *aspect* or *fragment* of the doing is interpreted as a certain action. Such partial interpretations are already dependent on a *relevance criterion*: The action of holding a pen is more specific than the action of sitting at the table, and hence its description carries more information for the hearer. In that case, the 'sitting at a table' action may be considered as a normal (possible) precondition for the execution of a certain action (we do not hold pens while sleeping or when swimming, for instance). More specific still, and given the criterion of 'situation change' (the other actions may also be taken as results of action and hence as states), is the action 'making lines on a paper.' This kind of description, however, is only given in situations where no further interpretations of the action can or need be given. Making lines on a piece of paper however, except for small children, is not usually an intended and goal directed action in a *social* context.

Therefore, the doings involved [viz., the more specific doing of the sequence of doings ('making lines on paper')] automatically are interpreted at a socially more relevant level, by the more global concept of 'writing' or 'writing one's name,' as in (6, d). The other doings, as we see, are no longer specifically interpreted as actions: Holding a pen, etc., *constructs* the action concept of writing, whereas sitting at a table is normal and can therefore be *deleted* in the more global action description.

Writing one's name, however, is still too general and may also be an action accomplished anytime we write our name and also when we do it for fun. To specify the specific social function in this particular context (we did not describe the context yet), this action may be further interpreted as 'signing a document.' This action has a number of *social conditions* and *consequences*: Only some social participants may sign particular documents (e.g., adults), whereas a number of rights and duties are the conventional or institutional . consequences of signing. Hence the *socially relevant* description of the action would at least be (6, e). Further interpretation is possible however. Putting one's signature on a document not only is an intended social action but also is embedded in a purpose: The agent has a certain *goal*. In this case, for instance, signing the document, which is a contract, may at the same time mean that the agent thereby acquires a house. His goal, therefore, is to possess a certain

house. In other words, an action may be described not only by taking one of the more specific doings as an intended action (write ones name) or as an intended social action (putting ones signature) but also as the more *global* (social) action of which the result or the goal is specified.

To be sure, 'buying a house' may *legally* coincide with putting ones signature on the contract, but socially this action may be much more complex: looking in the newspapers or consulting a real-estate agent, finding a house, having a look at it, making all kinds of financial arrangements, etc. What we did in interpreting (5) as (6, f), then, is assigning a global social action to a lower-level social action (signing a contract) that is a *crucial component, indication*, or *partial manifestation* of the global action. It is, strict1y speaking, a description of the *sequence* of actions an agent is *engaged in*, taken at a particular *point* (of time and place), but globally described in terms of the whole sequence.

Such interpretations, which have a hypothetical and inductive nature (other data would be necessary in order to derive the global concept), are also given in those cases where the action observed is not crucial. If we see somebody going into a bank, we may describe that action by saying *He is going to get some money*, which of course need not be the case but is normally or often the case.

Global interpretations of action may well he too general for a given communicative context. Sentence (6, f) is only usual in the office context to specify the *kind* of document being signed, whereas (6, e) would he the obvious answer to someone who is looking for the one who is now signing the contract but does not know what he is doing. Sentences like (6, 0 would rather occur in past or future tense, to describe an important social action that is worth telling about. The same in fact holds for the following examples: They would not often occur as *descriptions of actions during observation* but rather as descriptions of past and future actions of another agent. Note that, as the third person indicates, the interpretation/description is that of an observer of the proper doings in the first few examples, whereas the other sentences (in other tenses) may also be used by language users reporting an action they heard about.

The next sentences are also interpretations of 'what somebody did' but are interpretations of actions rather than interpretations of doings. In (6, g) the action is seen in its *function*, as a condition for some *consequences* (making one's children happy). The same holds for (6, h). We see that actions may be further interpreted by mentioning the (interesting) consequences of those actions, which need not be among the goals of the agent [as in (6, h)].

Interpretations, as we may see in (6, i), are often closely related to *evaluations*, especially when social actions are involved. Instead of the proper action description the describer directly assigns a negative-action category or

predicate to the action involved (buying a house or signing the contract). These evaluations may be implicit in the use of certain predicates, which at the same time describe the action *and* the attitude of the describer:

(7) He is spoiling his children.

Finally, a still more global action description is possible by focusing on the global wants, desires, needs, wishes, motivations, or purposes of the agent. In that case the action is taken as the result or goal of these mental properties of the agent and described (indirectly) by specifying these properties. In general, thus, we may interpret actions by focusing on the action itself or on the conditions and consequences of the action. Similarly, for the characterization of action in terms of the *mode* of the action, that is the way it is performed:

(8) He is being very careful!

The interesting conclusions from this analysis for our macrostructure hypothesis are, first that in most cases actions are not described at the basic level but at a more comprehensive, global, and socially relevant level. Strictly speaking, then, the description of action would nearly always involve macrostructures, at least with respect to immediate and close observation. Second, if the communicative context of description is different from the observation context, we take not only the socially minimal actions but the more global socially relevant and 'interesting' functional actions (buying a house). Of course, this *also* follows from the normal constraints on discourse and narrative: We say or tell in principle only the things we think are interesting or necessary information for the hearer. However, also in observation/interpretation this global interpretation may be necessary, because the observer especially wants to represent what the agent is socially being involved in. Later we see that this is necessary for the establishment of the adequate social contexts and frames. Third, we have observed that (global) interpretation need not be based on the action itself but may also be based on conditions, mode, or consequences. Finally, global interpretations often involve evaluations.

4.5.6. In subsection 4.5.5 we show that global action assignment, and hence macrointerpretation, also occurs on the basis of individual actions. This is possible when some action is taken as a (crucial) component of a sequence or when more global goals, results, or motivations are described for which the observed or communicated action is an indication. Finally, global evaluations may be given of any individual action.

From our discussion however it appears also that such global interpretations at least implicitly involve knowledge, assumptions, or

expectations about other actions of an *action sequence*. The global representation for actions, then, is relevant in particular to account for complex action or action sequences, in a similar way as we have observed for discourse. At a rather low level an action sequence was already involved in our previous example: The series of doings could individually he interpreted as a sequence of (basic) actions. One way of interpreting and describing such a sequence is to focus attention on the crucial, more specific, new, or relevant actions involved, leaving the others. We see that what is applied here is the macrorule of DELETION: Actions (or rather action concepts) are abstracted if they are no longer relevant for the interpretation and hence for the description of the *sequence as a whole*. Similarly, the CONSTRUCTION rule is applied to derive the global social action (at a rather low level) of signing a contract on the basis of the normal action.

We now have to investigate whether these macrorules hold for the representation of action sequences in terms of global actions also in other cases and on other levels. Let us therefore again take an example. Since the macrorules do not apply for doings but for actions, we start with an expression for a sequence of rather low-level actions and see how they can be mapped by the rules on more global actions:

(9) (a) Peter mowed the lawn.
     (b) He watered the plants.
     (c) He cut the roses.
     (d) He put fertilizer on the flower beds.
     (e) He pruned the apple tree.
(10) (a) Peter was working in the garden.
     (b) Peter was gardening.

We assume that the sequence of actions expressed by (9, a-e) may be represented by the action concepts expressed by (10, a) or (10, b). The macrorules that can be applied here are GENERALIZATION or CONSTRUCTION. The first rule would obtain if each of the actions would count as an instance of (10) and hence entail (10). CONSTRUCTION would he applied if working in the garden includes doing a number of things in the garden [e.g., those mentioned in (9)], which however need not be the case because other things may be done and also in a different order. The actions of (9) are all more or less at the same level and therefore DELETION would not apply, because no relevance distinction can be made.

Note also that the actions represented in (9) are themselves described at a (low) level of abstraction: Mowing the lawn involves taking the lawn mower from the shed, rolling it over the grass for some time (in a specific way), Putting It back, etc. The same holds for the pruning action. Such more

detailed actions, however, are not usually described (even if they are noticed in observation), because they represent normal conditions (preparations), components, and consequences of these actions. Hence, we assume that at a certain level an action is interpreted *only* globally, because it is at this level that the action is interesting or relevant. Of course, cognitively, construction operations must apply in order to obtain this first-level global interpretation. Typically, both of the sentences of (10) could be used in an *action discourse* as the first, *topical sentence* of (9), which shows the macrostructural nature of (10).

Although we express (macro-)actions in sentences, our analysis does *not* hinge upon the use of language. We could have used pictures in order to represent (9), and the resulting *conceptual* macrostructure would have been the same. It is interesting however that it would be problematic to express (10) by a picture. Whereas we may have summary sentences to express the macrostructure, we do not have in the same way 'summary pictures.' We may express one action (not clearly identifiable) by a picture and obtain descriptions like (10). Also a clear *crucial* action may be represented and be interpreted directly as (10). Again we see that doings and hence representations of doings are not the level where global interpretations take place. We need conceptual structures to apply macrorules also for action sequences. In cognitive processing, actually seeing any of the actions of (9) may lead directly to the assignment of the more global action descriptions of (10) if the actions of (9) are taken as *immediate constitutent indices* of (10). This may even be necessary if we observe Peter from a distance passing in a car, etc. In *descriptions* we are back at the level of verbal communication with its own semantic and pragmatic constraints. If someone would phone Peters house and his wife would answer the phone, she would be able to say (I 0)-in the present tense-even if she would have information about the actual action of Peter (e.g., mowing the lawn). The more global representation is however sufficiently precise and hence socially relevant (e.g., as a reason for Peter not being able to take the call or for the reason that she might take a longer time to call him than usual).

One of the problems in the theory of action is that the analysis often is so close to the analysis of *action description* and hence to the (semantic) analysis of discourse and communication. Indeed, (10) would, as such, be a good summary for (9). What is seen, consciously noticed, etc., need not be described at all, and the same holds in the production process (planning). Yet, although the description in the form of action discourse also must satisfy the pragmatic criteria of appropriateness (see Chapter 5), at the same time ¡t expresses an interpretation of the action or action sequence and hence a way of representing action at some global level. The close conceptual links between semantic representations of action and those of discourse guarantee that our examples, expressed in natural language sentences, are really about

action. Of course, at the same time they provide insight into the nature of macrostructures in action discourse.

4.5.7.   Some further examples are necessary. Instead of taking an arbitrary example, we now follow our theoretical assumptions and construct an example to which the DELETION rule might be applicable:

(11)   (a) Peter was mowing the lawn.
         (b) Suddenly he walked on a snake.
         (c) He cried out.
         (d) He jumped away.
         (e) He ran into the house.
         (f) He took his baseball bat.
         (g) He ran into the garden.
         (h) He looked for the snake.
         (i) He saw it under a bush.
         (j) He pushed the branches aside.
         (k) He hit the snake on the head.
         (l) The snake was dead.
(12)   (a) Peter walked on a snake.
         (b) He killed a /the snake.

The simple little story of (11) contains an action description that may be summarized by (12, a) and /or (12, b). Note first that pure action descriptions are rare for these kinds of narrative events: One also describes states of the agent, involuntary doings, and the presence of relevant objects, events, etc., belonging to the *action context* of the action sequence. This is a feature not only of action descriptions but also of perception and interpretation, as well as in the planning of action in general. Actions are usually operations *on* such a context or are conditioned by factors of the context. In Section 4.8 we investigate this point in somewhat more detail for the social context.

In our elementary story example the summary expresses propositions that also were part of the full action description, at least for (12, a), whereas (12, b) is obtained by simple CONSTRUCTION from (11, k-l). In other words, one or two information items of a whole sequence of actions are selected and the others are deleted or abstracted by construction. The DELETION rule indeed may apply because the fact that Peter was mowing the lawn is not relevant for the sequence as a whole. It is at most a background or setting for the action sequence. The other actions are again either normal conditions (running into the house to get something from it), normal components (looking for the snake, seeing it, and hitting it), or normal consequences (crying out when walking on a snake, etc.) of the major actions. Thus, important in the

sequence is only that Peter walked on a snake and killed it. The other actions could have been different and the main actions would still be the same.

Why precisely these actions of the action sequence are assigned relevance is not only due to structural reasons, such as the dependence of the other actions, but also due to the *general wishes and goals* of the agents (in a certain culture, class, etc.). Any event or action that is directly favoring or threatening the realization of these wishes and purposes in a high degree, such as meeting, a life companion, receiving your Ph.D., earning a lot of money, being involved in an accident, or losing a lot of money, has high relevance in planning, interpretation, and description. Hence it also is important as the Complication in specific action descriptions (viz., stories). These 'macrowants' or 'macropurposes' as we may call them dominate for a more or less long time and in many action contexts the actions of an agent.

The DELETION rule in discourse requires that the deleted proposition is not an interpretation condition for other propositions in the discourse. The same constraint on the rule operates in action sequences: We may - cognitively- delete any action concept that is not a necessary condition for the execution of other actions. However, the constraint must be more complicated. In our example we precisely omitted those actions that are often necessary preconditions. If these are normal parts of the main action, however, they are abstracted by CONSTRUCTION. So, nonnormal major conditions (causes, reasons) are not deleted, although of course they may be generalized.

4.5.8. Finally, after having already seen some occasional examples of CONSTRUCTION, let us give a characteristic example of an action sequence that requires the application of this important macrorule:

(13) (a) Dorothy went to the bank.
(b) She entered the bank.
(c) She walked to the counter.
(d) She had to wait a long time.
(e) Then it was her turn.
(f) She filled out a check.
(g) She showed her identification card.
(h) She obtained the money.
(i) She left the bank.
(j) She went home.
(14) (a) Dorothy went to the bank.
(b) Dorothy /she cashed a check.

Again we assume that (14, a) and/ or (14, b) are acceptable summaries of action description (13) and that hence the global actions denoted in (14) arc, the macrostructure of the action sequence described in (13). The example is

stereotyped: It describes a social action sequence that is repeated rather often by many people of a given culture and which they know, recognize, and partly automatize. The specific knowledge structures about such typical episodes have been called *frames* or *scripts*. They are necessary in the planning, control, execution, interpretation, and description of stereotyped action sequences. They specify the normal *expectations* of the participants in the episode; they allow the necessary *inferences*; etc. We discuss them in more detail in Chapter 6. The presence of conventional knowledge allows an observer to abstract the global action concept (viz., cashing a check or getting money) from the sequence as a whole.

Recall that the sequence only *jointly* entails the global concept. If Dorothy would have gone through all the movements but would have forgotten her identification card, she would not have cashed the check or not have received the money. Note also that global actions, as we saw before, may be detailed by describing the global context, condition, component, or consequence: (14, a) may be used to summarize (13), although in fact it merely specifies a normal condition. The *inference*, due to the frame or script ('going to the bank'), is then that she obtained some money there. The same holds in *observation*. We need only to see crucial aspects of the full action sequence to be able to derive the global actions performed. This means that although, formally, the CONSTRUCTION rule is based on joint sequences of information, our knowledge of the world allows us to apply strategies by which we derive inferences as soon as we think we have enough data. Of course, such hypothetical inferences may need correction later.

We here touch upon a rather important aspect of action theory. Earlier we have specified under what conditions action sequences are connected, coherent, directed, etc. Such conditions assume that the action sequence is *continuous*: There are no gaps. Of course this is not always the case. Many action types are discontinuous and are performed in parts or occasionally, such as 'studying linguistics,' or 'building a house.' However, even in continuous action types, planning, interpretation, and description may be *fragmentary*. If we see somebody coming into the bank and some moments later see her before the counter, we assume that she walked that distance and did not fly or take a bike; that is, we have *normality assumptions* about fragments of (inter-)action sequences. When observed they are mapped directly onto a more global action; when not observed they may be -if necessary- inferred from the global action concept and/ or the knowledge from associated with it. In Section 4.7 we briefly pay attention to the consequences for action descriptions and stories.

Typical for the construction rule is that a global action is represented (planned, understood) with respect to all kinds of lower-level properties of the action. It is by the lower actions that the global action is actually performed, just as macrostructures in discourse are expressed by the subsequent

sentences of the sequence in which they are derived. These lower-level properties of the global action are the usual *conditions, components,* and *consequences:*

> (a) *Action context*
> place, time, circumstances, objects, other persons, relations between agents, properties of agents (knowledge, abilities);
> (b) *Motivation system*
> needs, wishes, wants, preferences, decisions, purposes;
> (c) *Planning system*
> global intentions (plans), intentions;
> (d) *Execution system*
> doing, modes of doing, organization, control, checking, coherence maintainance, result establishment;
> (e) *Consequences*
> goals, further consequences, next actions.

4.5.9. Although many action sequences occur in a stereotyped way, it is not always possible to apply a construction rule. Construction involves more or less coherent units, which themselves can be components in higher-level sequences. Cashing a check, thus, is part of socioeconomic behavior in which we buy goods and services in everyday consumption. The same holds for such episodes as dining in a restaurant, going to the movies, shopping in a supermarket, or eating breakfast. As soon as we have action sequences that, although as such occurring frequently, seem to contain boundaries between script-like episodes, we often do not apply macrorules to form another unit:

> (15) (a) John went home with the streetcar.
> (b) At home he washed the dishes.
> (c) He took a beer from the refrigerator.
> (d) He prepared dinner.
> (e) He ate his dinner.
> (f) After dinner he looked TV.

The actions described in (15) are already at a medium level of generality. Some of them are governed by scripts, such as taking the streetcar and preparing dinner. For many people the sequence is part of everyday life. Yet, it would not be easy to map it on a more global concept. At most, generalizations of the kind 'John was relaxing after work' would be possible, but they would not be the lowest possible global concept for the sequence as a whole. The conclusion of this observation might be that at certain levels global interpretation is no longer possible or at least we need not always have language concepts for possible cognitive units. Also it may be that the global

organization of action respects certain *boundaries* between socially relevant sequences. For instance there would be a boundary among daily work activities, going to and coming from work by public transportation, and the various activities at home.

Instead of the construction rule, and besides the possibility of global generalization and evaluation ('I had a rotten day today'), the deletion rule might pick up the (global) actions that are 'outstanding' in such sequences of everyday activities. Since washing the dishes, having dinner, and watching TV are *normal* home activities, they would not as such qualify for selection, except in a communicative situation where one is asked 'What did you do last night.' In that case, we would mention 'watching TV' and not 'having dinner.' In a police report, where detailed information may be relevant and not only the major actions, however, a full account may be necessary, even at lower levels of specificity.

We observe a difference, then, between what is normally accounted for in everyday stories and how we globally organize our daily activities. Stereotyped episodes are necessary for strategically effective planning, cooperation, understanding, etc., but they are merely the *background* for the relevant or *foregrounded* events and actions, such as incidents, accidents, unexpected luck, or bad luck, that underlie storytelling.

4.5.10. There is little argument that the global interpretation of action sequences depends on *culturally variable* knowledge. Except from some more or less universal ways of accomplishing rather elementary forms of action and interaction, the stereotypical properties of most action sequences are particular for each culture, subculture, or even class. Thus, given a constructed example of the following action sequence, we would not know whether the sequence would count as the usual way of 'doing *x*':

(16) (a) Itzi-hua went into the forest.
 (b) She touched the old palm trees.
 (c) Then she went to the river.
 (d) She washed her face.
 (e) She took a big stone from the river.
 (f) She went to a clear spot in the forest.
 (g) She buried the storie under decaying leaves.
 (h) She waited on the spot until dusk.
 (i) Then she went home again.

Although at the lower level each of these actions are superficially understandable, we do not know the respective *functions* of the actions in the whole sequence; especially we do not know which *global goal* is associated with the sequence. It may be the ritual sequence preceding marriage; it may be

a sequence of a religious nature or nearly anything else. However, even for our understanding the sequence seems to have a *ritual* nature because we do not understand what the normal everyday function of burying a stone under decaying leaves might mean: Its result does not have obvious goals as consequences. Similarly we ignore whether some actions are optional variations (touching old palm trees) or necessary components of the global action (if any).

4.5.11. With a few examples we have been able to back up the hypothesis that the fundamental macrorules also apply on action sequences. Of course, this is not surprising. Macrorules were designed to handle *complex information* of any kind, and the similarities between action in general and the specific actions we accomplish by conveying messages by uttering discourses of a language are obvious. In both cases we have kinds of 'expressions' with which are associated socioculturally determined conceptual meanings.

   The question is now whether action sequences would need *further macrorules* and *specific constraints* that we did not or were unable to discover for discourse. Although further empirical research would be necessary on this point, there is at least one feature where macrostructures of discourse may be of a different kind than those of (inter-)action. Discourse has been studied as a structural unit, with an overall meaning. Action however involves changes in states of affairs, which are time-determined, linked by causes or reasons, and directed toward a certain result and its possible goal consequences. This may mean that the notion of *importance* or *relevance* for action sequences is given not only by the *level* of conceptualization but also by the degree of *effectiveness, success,* or similar notions. In other words, each action that is an important contribution to the success or the failure of an action sequence should be taken as being relevant. Instead of simply applying DELETION on the irrelevant or subordinate actions of the sequence, we might need the more 'positive' counterpart of this rule that operates a SELECTION of so-called *main actions* of the sequence. It could be argued in that case that the analysis is no longer a macroanalysis, because it merely emphasizes certain (micro-)actions of a sequence. We see in Chapter 6 that something similar is possible in discourse: Our task, interests, norms, etc., may assign salient detail function, contrast, or in general relevance to propositions at the microlevel. Yet, it will also be shown that such a kind of *local* relevance assignment also occurs in (inter-) action: We know that certain 'small acts' of people may be very striking although as such these acts may not be very relevant for the sequence as a whole. The relevance we mean here is that of a more global level: It pertains to the way an action contributes to the success of the sequence as a whole. Peter's killing the snake, in our earlier example, is much more crucial for the

effectiveness of the action sequence (viz., reaching the goal of eliminating serious dangers) than his crying out, running, taking a baseball bat, etc. Hence we want to take up such actions directly into the macrostructure. Of course we have the ZERO rule for this, but a more powerful rule may be necessary to obtain crucial information at the macrolevel about the (high) effectiveness of actions (positively or negatively). We may simply call this rule that of EFFECT, which underlines the result or goal directedness of the information thus selected.

4.6. FUNCTIONS OF MACROSTRUCTURES IN (INTER-)ACTION

4.6.1.   In the intuitive account of the global structures of action given in the previous sections, a number of cognitive and social *functions* have appeared that may be summarized as follows:

Sequences of (basic) actions are forms of highly complex information that for various reasons needs *reduction* by assigning them macroactions. Memory limitations, planning, execution, control, and observation appear to make this kind of reduction necessary.

In particular, the assignment of the global action makes it possible for the agent, coagent, and observer to know at each point of the sequence which action is now globally being performed and hence what the ultimate sequential and global intended results and goals are. Only with respect to these may it be determined of each action whether it is *reasonable* and *effective*. In other words, local 'meaningfulness' of action depends on its function within a globally meaningful action. The same holds for the assignment of local connection and coherence *between* successive actions of the sequence.

Global action interpretation not only reduces but also *organizes* sequences of actions. It determines which unit can be isolated from a series of activities, what the *particular* results and goals are, what the initial and final actions of a sequence are, etc.

Finally, global action interpretation allows efficient ways of *representing* and *describing* action sequences at several *levels* and with varying degrees of *completeness* and *relevance* for the social action or communication contexts.

4.6.4.   There is another function of macrostructures in action that needs separate analysis. Until now it has been assumed that action sequences are occurring more or less in isolation. In real action contexts this is not the case. The same agent at the same time does a lot of other things. This may mean that several actions or action sequences *coincide* or *overlap*. Yet, from this

sometimes highly complex set of activity data we are able to select and identify one global action: So to speak, we may follow a *line* of action. Consider for instance the following complex activity description:

(17) (a) Harry is giving a lecture.
   (b) He is talking about story comprehension.
   (c) He emphasizes the role of story schemata.
   (d) He is walking to the blackboard.
   (e) He takes a piece of chalk.
   (f) He continues talking.
   (g) He plays with the piece of chalk.
   (h) He writes a story schema on the board.
   (i) He looks at the audience again.
   (j) He sits down again.
   (k) He looks at student *x*.
   (l) He is still playing with the chalk.
   (m) He reorders his notes.
   (n) He runs his fingers through his hair.
   (o) He looks outside.
   (p) He looks at his watch.
   (q) He is crossing his legs.
      etc.

This still highly incomplete description of activities, some of which may interpreted as actions, may be an account of the global action of 'giving a lecture.' Now, our thesis is that only if we have this global action concept are we able to select from the bundles of activities the relevant line of action containing the component *action base* for the global action. Clearly, as in the case for discourse, *frame* and *script* knowledge is involved in this global interpretation. In any case we are now able to decide which of the doings are actions and which are normal conditions, components, or consequences of main or global actions: Taking chalk is a normal condition for writing on the blackboard, which is a normal component of giving a lecture. This is not the case for playing with the chalk or running fingers through one's hair. *These* doings, though, may be assigned another *global interpretation*, parallel to the global action assignment (e.g., that Harry is nervous). We see that the interpretation of a global action involves recognition of a global plan and purpose; this determines which component actions are meaningful, hence which actions are to be connected, and hence which action line can be isolated from complex activities. Note that it is possible also to have *several* global actions in one activity bundle (e.g., having a discussion with someone and at the same time serving food). Depending on social context and frame, these global actions may again be hierarchically ordered: During a party the conversation may be more important; in a restaurant, serving the food.

4.6.3.   What is said in this and the previous section about macrostructures of action also holds, *mutatis mutandis,* for *interaction* sequences and the functions of global interactions. Interaction sequences must be *identified* or identifiable among the complex bundles of the activities of several social participants. In that case the assignment of common or different global intentions and purposes is important, and the realization of global results and goals according to these. Second, the participants must know what common global action (e.g., cashing a check) they are being engaged in, so that they can properly plan, monitor, and execute their respective actions, meaningfully, to an established global result.

Clearly, the assignment of global interaction concepts does not exclude different *perspectives* or points of view on the global action. What for *A* is a nice talk can be a quarrel for *B*, once given the global identification of a common conversation. This point of view also appears in the *description* of global interaction. Whereas 'holding a meeting' is neutral, the global description 'cashing a check' is given from the point of view of the customer or from that of an observer of the customer whereas 'paying/ accepting a check' may be the global action concept assigned to the same doings by the bank clerk.

4.7. THE DESCRIPTION OF GLOBAL INTERACTION

4.7.1.   On several previous occasions we have seen that the global organization of action and interaction is intimately related to the global *description*. Such descriptions are given in various kinds of action discourse, such as reports, announcements, prescriptions, stories, and protocols. Action descriptions are on the one hand determined by *global representations* of action sequences and thereby indirectly indicate the global organization of action; on the other hand it may depend on the various constraints of *communication*, where points of view, evaluations, etc., play a role and the usual pragmatic and social features of adequate discourses. In Chapter 2 we also see that the assignment of macrostructures of discourse depends on the semantic representation of related facts. In action discourse this means that the structure of action determines what the global organization of the discourse is: lf action sequences are connected and linearly coherent, if they can be mapped on global action and interaction concepts, and if these can be verbally expressed, the discourse is globally coherent if denoting global (inter) actions.

4.7.2.   Interesting in a theory of action discourse in general and for stories in particular is the possibility, discussed in Chapter 2, of changes in *levels* and relative *completeness* of the description. We have given examples of

discourses where some sequence of actions is described in rather global terms, such as 'I went on vacation' or 'She studied psychology,' whereas other action sequences are described in more detail. These changes are not arbitrary. First, as we have seen, all kinds of well-known preparatory and component actions need not be fully described, even in their instantiations for particular individuals, if they belong to a frame or script. This part of the action description is, so to speak, merely the 'background' or, indeed, the 'frame' for the description of new or interesting actions. Hence, if in a story a certain part (e.g., a robbery or an accident) is described, it may be described in detail, on the one hand because the actions and events are new and worth telling about and, on the other hand, because going into lower-level details may provide greater suspense and 'vividness,' which are pragmatic and rhetorical devices of effective action description in stories.

4.7.3.   At this point we should ask ourselves whether the parallels between discourse and interaction at the global level also holds for *schematic superstructures*. Do action sequences also have functional relations in general and conventional schematic structures of categories in particular?

As for the functional relations it may briefly be recalled that indeed action sequences may be functionally organized: Some actions may be *preparatory* for other actions and similarly, we may perform *auxiliary* and *opposing* actions, defined in terms of their positive or negative goals in the establishment of conditions for other actions.

Conventional schematic categories for action sequences may be found in various conventional and institutional social contexts. Just as discourses may be introduced or opened and concluded or closed, action sequences, such as a meeting, a court trial, or a bus ride, may be opened/ started and closed/ finished. Further empirical research into various kinds of social frames and scripts is necessary however to establish possible categories. Note though that schematic categories should not be confused with socially 'fixed' actions themselves. Thus, a trial or a breakfast consists of a sequence of standard actions that sometimes are even institutionally prescribed. No more than fixed topics or themes of discourses, such stereotypical actions are functional categories and hence do not form superstructures.

4.8. MACROSTRUCTURES IN
SOCIAL INTERACTION

4.8.1.   After the more general discussion about macrostructures in action and interaction we finally try to be more specific about the role of global structures in the *social context*; that is, until now we have neglected the properties of the interaction context and have made a number of abstractions

about situations, agents, observers, and the various social rules defining the context and the possible actions and interactions of the social participants. It goes without saying however that interaction is essentially a social concept and understanding its basic principles is not possible without inquiring into the structures of social situations in which interaction takes place.

Although it cannot be our aim to give even a summary of one or several theories of social structures, organizations, and situations, we briefly mention some of the key concepts involved in the characterization of the situations in which interaction takes place.[2] Nor will it be possible to survey all the domains and problems where a theory of macrostructures in interaction could be elaborated or applied. Besides further empirical work, this would require an analysis of extant social theories for their, often implicit, use of global concepts. Our discussion therefore has at most the value of a tentative illustration of the ideas developed previously.

4.8.2.   It has been emphasized that macrostructures, both of discourse and of interaction, have a conceptual nature and that therefore they require a *cognitive* basis. This also holds for the role of macrostructures in the social context. What we are concerned with here, then, is the way social participants interpret and construct social contexts. The actual cognitive processing underlying such interpretations are the object for Chapter 6, so that in this respect the sociological theory again deals with abstract concepts, whatever their 'real' social manifestations.

The main question we would like to deal with here is the following: Given a social situation and given participants involved in interaction in such a situation, how do they represent 'what is being done' in the situation, and what is the role of global analysis in their interpretation and the (inter-) actions based on such an interpretation? In other words, how do participants go 'beyond' the level of interpreting the immediate, local doings of themselves and others, and how does this higher-level processing influence their experiences?

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[1] For the various concepts and some of the arguments used in this section, we are especially indebted to the current work on social interaction in microsociology, as it is done in the so-called 'ethnomethodological' paradigm. We mention in particular the work reported in Sudnow (1972), Goffman (1967, 1970, 1974), McHugh (1968), Douglas (1971), and Brittan (1973).
Some of the concepts used have been taken in different meanings as used elsewhere. In those cases we have given brief definitions ourselves. Whereas the other chapters are based on extensive theoretical and empirical research of our own, it may have become clear that his chapter on (inter-)action only is based on our own work on abstract action analysis and action discourse and not on empirical inquiries into social interaction. It is impossible to fully survey here the work, mentioned previously, of sociologists for observation and analyses that are relevant to our macrostructure hypotheses.

Such an inquiry into some issues in the field of cognitive sociology would also need various concepts from *social psychology*, such as those of social knowledge, beliefs, opinions, values, norms, and attitudes. Except from some brief remarks about the global organization of these 'underlying' systems in Chapter 6, however, we further ignore a serious analysis of these notions.

4.8.3. The first set of relevant social concepts we should briefly introduce are those of the various *social environments* of interaction. We have used terms like *situation* and *context* and have made provisional distinctions between them that should now be specified further.

We are brief about the higher-level units of social organization. We may talk about *social systems* when referring to such sociocultural systems like those of 'Western-capitalistic-industrialized' and their variations. Closer to the level of our analysis such systems are defined in terms of constituent *social domains* such as those of public health, public transport, education, sports, media, and their various *organizations* such as factories, business firms, universities, and airlines, which may be *institutional* like parliaments, law courts, churches, universities, and hospitals or noninstitutional like business firms. The organization of social *participants*, then, follows another line and may go from strata or classes, to groups, subgroups, families, or other socioeconomical basic units, which need no further discussion here.

Relevant for our discussion is another level of analysis, viz., that of the various immediate environments of social interaction. We therefore use terms like *social setting (*or *places)* when referring to homes, streets, movie theaters, restaurants, doctors' offices, classrooms, or hospitals, possibly with even closer environmental locations like rooms or street corners. It is 'in' these setting that we define the various social *situations*, such as take a bus, go to see the doctor, eat in a restaurant, give a lecture, have breakfast, cash a check, being ripped off, play a game of chess, or have a party. Although it is not claimed that all interaction sequences occur in such, conventionally identifiable, situations, we provisionally limit ourselves to this kind of situation. Situations include both the setting and the interactions performed in the setting. Situations that are stereotyped, standard, or normal are called *frames.* Frames typically involve stereotyped interactions and fixed participant categories (see below). Thus, taking a plane or eating in a restaurant have frame nature, whereas being ripped off or having an accident have not. Intermediary forms of course exist (such as going to a pop festival).

Social situations are characteristically exhibiting happenings of various kinds: processes, events, and more specifically (inter-)actions. These interactions may be abstractly organized in *sequences* that, together with events of other kinds, form *episodes.* Interaction sequences or episodes in general may also have a stereotypical nature and in that case are called *social*

routines, lacking a better term for standardized interaction sequences. Of course these (social) routines should not be confused with the cognitive (motor) routines of automated lower-level doings (like those of walking, eating, etc.). We see later that these routines correspond to the term *script,* which is the cognitive representation of routines in general social knowledge. Routines are the core of stereotypical situations (viz., of frames). Interaction sequences in social situations have lower organizational units that we simply call *transactions*. Transactions are interaction molecules involving a short sequence of actions and interactions of some social participants. A routine (that is, a stereotypical interaction sequence in a frame) consists of a sequence of standard transactions, such as buying a ticket, ordering a meal, exchanging information, or exchanging greetings. The atoms of transactions are the *basic social interactions* we have discussed earlier: Look at somebody, hit somebody, give something to somebody, call somebody, warn somebody, carry a table together, or shake hands. Below this level we have global and basic actions and doings that have been discussed earlier (eat a hamburger, take one's purse, look around, etc.).

Not all the elements of a situation and its setting are systematically relevant for the development of the interaction sequence. We therefore use the term *context* in the more specific sense of an organized set of situational factors that condition the interaction sequence. Thus, seats and also some other passengers are part of the bus situation and its setting but need not be part of the context; the driver I buy a ticket from and the girl sitting across and to whom I talk are part of the context, so am I, and so are our various personal properties. Contexts of interaction and communication may change all the time, and factors of the situation that were not part of the context before may now become part of it.

4.8.4. Situations are defined not only by their settings and the interactions and transactions that may or even usually occur in them but also by the participants accomplishing the respective (inter-)actions. The various actions that they may or will usually perform depend on the different *categories* of participants. Category types are *roles* (passenger, friend, guest, etc.), *functions* (doctor, policeman, teacher, student), *positions* (helper, observer), and *relations* (father, daughter, neighbor). Thus, a man on a bus may, in his role as passenger and in his function as doctor, assume the position of a helper, when taking care of his daughter, to whom he is the relation, when she suddenly becomes sick. These category names are provisional here and are often used more loosely under the general term 'role.' It is important that the various categories are associated with possible or necessary actions or interactions (viz., with duties, rights, obligations, or permissions). Depending on the categories and the situation type, it may be more or less established who may do what (to whom, with whom) under what conditions.

The interaction sequence, therefore, is regulated by sets of *conventions* (norms, rules, habits, etc.) that for each participant category formulate the possible, likely, or necessary actions and interactions (e.g., the necessity of paying by passengers when using public transport).

4.8.5.   With these few notions which cannot be properly defined here but which have merely been distinguished with typical examples, we take a closer look at social situations and the role of global interpretations (of 'what is going on') by their participants.

A first property of social interaction sequences, and especially social routines, is that they are usually assigned a global action concept: See a doctor, take a bus, go to school, or arrest a criminal are functioning as units in situations due to this kind of global interpretation. Interactions and transactions may be understood and evaluated only with respect to this global concept. We see somebody sitting in a doctor's waiting room and we interpret globally that he is 'going through the moves' of seeing a doctor. Similarly, we generalize from sitting, standing, etc., to the more global notion of 'waiting' as one of the preparatory, or component (trans-)actions of the routine. Thus, the actions of a repairman who repairs the door of the waiting room will not be globally interpreted as 'seeing the doctor' because it cannot be generalized to waiting behavior in the first place and because one generalizes toward the alternative routine 'making a repair.'

The global interpretation of observed actions and (inter-)action sequences by observers and participants is necessary to make the needed inferences about the situation or frame that is now actual. This is because it is with respect to the situation or frame as a whole that the various action conventions operate. Let us assume that an agent has the knowledge (i.e., the script) about the typical interaction sequence (i.e., the routine) in a particular type of restaurant. The various conventions, however, pertain not only to this typical action sequence but also to the whole frame, including the setting of the restaurant and therefore all kinds of expected objects and properties of the restaurant and also the possible other participants (guests) and the eventual interactions with them. In other words, the frame and its rules define a set of acceptable routines. Identifying the correct situation or frame, then, allows the agent to make alternative choices at various points of the execution of a routine.

Finally, once assumptions are made about the global action now being performed, the participant(s) know what global results and goals are planned and aimed for by the agent. After necessary evaluation of these states of affairs with their own preferences, the participant(s) may either cooperate or oppose the actions of the other.

4.8.6.   The social role of global interpretation just mentioned is so to speak the 'standard' function, which is determined by basic cognitive principles of organization and reduction of (social) information and the necessity to plan, derive expectations, and anticipate. Socially, the major function involved is the possibility of adequate interaction, once the situation conventions are known, given assumptions about the intentions and aims of others.

Clearly the knowledge of global action and interaction and the situation in which they appear also determines the interpretation and evaluation of actions and action coherence at the lower level of *local* transactions. If I am on a train and some copassenger would ask to see my ticket, I would at least wonder why, ask so perhaps, and expect an explanation for such a request. It would be acceptable only in a situation where I would know the passenger already (e.g., by previous conversation in the train) and further if the ticket, for instance international tickets, would have some interesting property. As soon as an official of the railway company arrives and asks for my ticket however, I show it to him right away, upon exactly the same request. In other words, given the external properties of the ticket inspector, I (re-)actualize cognitively-the railway/ train frame, and its possible routines, and identify the request to see my ticket as a normal, rule-governed, interaction introducing the routine transaction of ticket inspection, upon which I can correctly accomplish my interaction part of the transaction, to show him the ticket.

Another   example   of   local   interactions   interpretation   and   the interdependence with global interpretations of routines and frames is this: Under specific circumstances, doctors have access to various touching and feeling actions on any place of the naked body of patients. The 'style' of such actions should be in between the bounds of 'rudeness' on the one side and 'gentleness' on the other side. As soon as even this difference in style is changed across these boundaries (which may change from person to person), the global interpretation may change, and so the perception of further actions. Thus, as soon as the movements of the doctor would clearly be identifiable as 'caressing,' the global interpretation (viz., that of an examination transaction in the 'see a doctor' frame) would change toward the flirtation transaction of the 'male chauvinist' situation. Something similar may occur in the other direction. Thus, some years ago, when the abortion practice was not so common as it is now, a big Protestant hospital in Amsterdam was said to have doctors and nurses who did examinations very rudely on those (often unmarried) women who wanted an abortion -and who could even have one for medical reasons. In such a case, the interpretation of body touching and actions, being part of the examination transactions, may well be assigned the global interpretation of disapproval and discrimination. Once this

interpretation is established, the individual transactions are if possible interpreted in that framework.

Note also that this interdependence between local and global interpretations of social interaction also involves the 'interpretation' of other participants. First, each participant category, for each situation and especially in frames, must follow the frame conventions. This means that, certain actions are possible or even necessary and others are not. The set of possible frame actions of a participant category in a given frame is called his *action domain* of that frame (which is a subset of the *action space* of the agent). Each action of a participant category is interpreted and evaluated with respect to this action domain. Other actions are then taken as 'weird' or simply as 'nonallowed.' In our example, the doctor who would not just keep him-(or her-)self in the gentle-firm range of naked body touchings could be judged as trespassing his action domain. This could lead to (justified or not) global interpretations but at the same time to a *global evaluation* of the person. Relative personality construction in social interaction therefore also depends heavily on (macro-)interpretations of interaction sequences. If the waiter does not come right away, is very curt in taking an order, does not smile, does not offer he1p if necessary, etc., the global interpretation, based on GENERALIZATION, often is that 'he is sour,' 'he is unkind.' The obvious cognitive importance of global personality interpretations need not be discussed further here. We only briefly want to stress that global interpretations pertain not only to interaction sequences but also to general properties (e.g., personality) of the agents involved in them.

4.8.7. We have more or less just repeated for the social context what we had said for interaction in general before; that is, the processes of interpretation involved are so to speak the 'standard' way of organizing the social environment: We take (inter-)actions as normal components of higher-order interactions or frames and conversely derive plans, expectations, etc., from frames.

More interesting, perhaps, from a sociological point of view, is the *strategic application* of macrorules. It readily is granted, and is even a well-known feature, that participants organize interaction by global interpretation, evaluations, the construction/ definition of situations or frames, etc. Typical for human interaction is, however, that the standard rules are not always followed or executed in specific ways or that other rules are established. The same holds for the macrorules as well. This would mean, theoretically, that social participants might do (not do) the following things:

(a) Given only one or two instances of actions, apply evaluative generalization.
(b) Delete relevant local interactions.

(c) Construct a global (routine-based) action even if insufficient constitutent actions are given.

and their negative counterparts:

(d) Do not apply generalization, although enough instances would warrant it.
(e) Do not delete irrelevant (detail) interactions.
(f) Do not construct global actions, although the necessary or crucial constituents are given.

One of the general conditions of these strategical (non-)applications of the macrorules in the social situation are the motivations and the purposes of the participant: lf the global action or situation is not wanted, (non-)application may yield the assignment of different global concepts and hence a *redefinition* of the situation. Such a redefinition allows the agent to perform different (inter-)actions than those required in the given situation. Let us give some examples of these respective strategies.

Strategy (a) is extremely general and especially involves all kinds of evaluation. If one or two actions of an official or somebody in a serving role are interpreted as 'sour' or 'impolite,' the generalization is made that the person *is* impolite or that the whole sequence is dominated by a 'negative' frame. Given this global interpretation, the participant may feel justified to break the conventions of the frame (viz., not to accomplish a duty or expected action, (as not to give a tip to the waiter), especially if that action is not preferred. Counterpart (d) runs the other way: It allows interactions to be interpreted or explained as 'unusual' or 'exceptions' if we do not want the general negative interpretation: We do not generalize toward a negative evaluation about persons we like, because this would lead to cognitive dissonance and would socially warrant participation in a frame, like an argument, of which we do not want the global result or goals.

The strategic use of the DELETION rule [(b) and (e)] allows participants to focus attention on details or to neglect relevant interactions. Thus, if in a more or less formal meeting one of the female participants wears a low-cut dress, this interactional detail may be focused upon in specific ways or even lead to global interpretations in various frames (provocation, seduction, etc.), which may be approved of or not, according to the norms of the others. The converse may hold in the same situation: Important arguments of a pretty female participant in the meeting may be deleted by irrelevance assignment in the global interaction sequence of the discussions.

Similar strategies operate in situations where CONSTRUCTION can be made or, conversely, where this rule does not apply. We see in Chapter 6 that an important cognitive strategy requires that individuals make a fast and

effective hypothesis about the global action or routine that they observe, read about, or participate in. In the social context this cognitive strategy is necessary for the appropriate interpretation of local actions of agents and for the effective planning of their own following actions in the routine. The social strategy involved may however be directed at the global interpretation of a sequence even if the presence of one (e.g., ambiguous) action of such a sequence would not allow construction. Thus, a student who is in love with his/ her teacher may construct 'normal' actions of the teacher (looking at him/ her, asking questions, etc.) as components in the global 'being in love' situation instead of the 'real' teaching routine.

This strategy may also be followed from the 'productive' side, from the point of view of the initiating or controlling agent. This happens for instance if the global interaction or situation is unpleasant for the other agent. Typical examples are having an oral exam or seeing a dentist. Although these situations are unambiguous, their negative evaluation may be reduced by establishing a pseudosituation that has a more positive evaluation. This may be done by the initial execution of interactions that are typical for the other situation. Thus, a dentist may start talking with a child about all kinds of 'other things,' toys or recent personal experiences of the child. In that case the situation is, apparently, no longer that of 'going to the dentist,' and the dentist briefly does not have his dentist function but assumes the role of a nice friend. The professor in the oral exam routine may in a similar way start with an informal personal talk with the student, thereby reducing the standard seriousness of the exam routine and the possible stress of the student. Another strategy is a redefinition of the exam itself, as a nontesting talk or discussion on a certain problem. Finally, we have the slightly more complex example of the 'traffic violation' routine. When I receive a ticket, I have the role of the traffic violator, which might lead to negative self-evaluation. By focusing attention on the specific acts of the police officer, I may however construe the situation in a different way: lf the policeman is impolite, the 'guilt' can at least be divided, so that receiving the ticket can be interpreted as an act of harassment, against which one may have justified anger. Note also that the opposite may happen: When the situation is interpreted in a more global way, as an instance of interaction with public officers, the agent may display all kinds of reactions that would as such be inappropriate in the traffic violation frame (e.g., being thankful for 'help').

4.8.8.   The examples just given of some strategical uses of macrorules in the social context are of course only anecdotical illustrations. Further empirical investigation is necessary about how people 'really' behave in social interaction. The examples are typical enough however-and many others can be given-to warrant the hypothesis that besides the 'normal' application of macrorules in the organization and reduction of complex social interaction

structures social members also apply the macrorules in a strategic or tactical way. We have observed that one of the conditions of this use of the rules is again cognitive; We try to interpret and evaluate social reality in such a way that our general beliefs, attitudes, norms, values, and interests need only to change minimally. This cognitive principle has of course its social correlate, which says that *in each situation each agent will interpret, and act upon, each action of other agents at the optimal macrolevel.* This optimality is calculated as the outcome of preferred beliefs, aims, and intentions, which are a function of the general factors of the cognitive set (attitudes, values, norms). Thus, buying a ticket in the bus is normally taken as the normal initial transaction of the bus frame and is taken up (by CONSTRUCTION) in the macroproposition, I am taking the bus,' which is the propositional plan of the routine. But the same transaction receives a different function and a different global interpretation in the situation where the girl buying the ticket is in love with the bus driver. In the stereotyped situation of frames, however, the participants as their next general principle go through the frame with the *focus on the global result or goal*: buying a meal in the restaurant, traveling to some place when taking a taxi, etc. This may imply that all kinds of stylistic variations, or even disturbing detail, are 'ignored,' because each action or event should be taken, if possible, as a transaction constituent of the routine. Thus, we refuse to interact with the drunken copassenger on the bus or the other client in the restaurant who makes 'trouble.' These are considered as not being 'our affair,' which is not only respect for privacy but also keeping the wanted global interpretation and execution of the current routine. It might well be that the specific 'disturbing' subsequence would otherwise distract us into an interaction sequence that we cannot handle due to lack of adequate plans or scripts. This does not mean by the way that such events are not memorized. On the contrary, they are precisely the complicating event of a later story about 'what happened' on the bus or in the restaurant.

We have seen that our analysis of social interaction involves both the general principles of global interpretation of action sequences and, more particular, social strategies. Such strategies allow participants for example to redefine frames by assigning alternative global interpretations to a given routine, which at the same time may also affect the local interpretation of interactions.

4.9. CONCLUSIONS AND OPEN PROBLEMS

4.9.1.   In this chapter we have analyzed global structures of action. Our approach has been similar to that taken in Chapter 2 on macrostructures in discourse. After a brief summary of the main properties of action in general, we have defined sequences of actions. Just like sentences, such sequences may

be said to be connected and linearly coherent. Unlike most discourses, however, action sequences may have final results and goals, which give orientation to the sequence. Meaningful action and interaction sequences are coherent and orientated not only at the local, linear level but also at the global level. It is shown that the macrorules formulated for semantic structures of discourse also apply to conceptual structures of action. They allow us to map sequences of actions on global actions or macroactions. Global actions also have global purposes and intentions (plans) and global results and goals that further determine the meaningfulness of actions at lower levels. The macrorules define which actions of a sequence are (un-)important and treat the same doings or actions at various levels of abstraction. Global actions allow us to identify and delimit specific (sub-)sequences of action among bundles of various human activities and to organize, plan, monitor, and represent complex action sequences effectively. Finally, global actions are at the basis of various descriptions of action in action discourses, where varying levels and degrees of completeness can be used for different pragmatic, stylistic, and rhetorical effects.

4.9.2. It is shown finally that global interpretations of action are socially relevant. Social situations or frames and the stereotypical action sequences performed in them first require definition of the global actions typically performed in such frames. Second, global interpretations may be strategically used (e.g., in order to redefine the situation or to optimize the wanted goals of the interaction).

4.9.3. Our analysis has clearly been tentative and incomplete on several points. First, it has been rather abstract, only paying attention to concrete social interaction in some illustrative examples. Whereas some of the cognitive aspects of action are taken up later, even the abstract analysis of complex action has not been without problems. It is, for instance, merely of an intuitive kind: No formal analysis of (inter-)action sequences is given nor a formal application of the macrorules. Nor has it been indicated what the specific constraints on global action formation are. Second, we still ignore when and how social participants use higher-level organization, planning, interpretation, and description of actions and especially which strategies are involved in meaningful and effective social interaction. Empirical research into social behavior is necessary to assess these functions and applications of global actions. Hence, both abstractly and empirically this chapter is only a first suggestion for an additional level in the study of complex social interaction.

5 Pragmatic Macrostructures

5.1. INTRODUCTION:
AIMS AND PROBLEMS OF PRAGMATICS

5.1.1.   After the analysis of macrostructures in discourse on the one hand and (inter-) action on the other hand, it is useful to have a closer look at the field where linguistics and the theory of action overlap, viz., *pragmatics*.[1] Pragmatics has become the third major subtheory -after syntax and semantics- of a theory of language. Its central object of study is so-called speech acts. A speech act, also called an 'illocutionary act,' is a social act accomplished by the utterance of a meaningful expression in a given context. Whereas syntax takes expressions and sentences as its object and formulates well-formedness conditions, and whereas semantics takes meaning, reference, and propositions as its object and formulates truth or satisfaction conditions, pragmatics has pragmatic function or pragmatic meaning and speech acts as its object and formulates so-called conditions of *appropriateness*. We say that a speech act is appropriate or inappropriate in a given context. This

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[1] Pragmatics, and especially the theory of speech acts, was first developed in philosophy (Austin, 1962; Grice, 1967; Searle, 1969) after which linguists began to be interested in the relations between speech acts and grammar (Cole, 1978; Cole & Morgan, 1975; Katz, 1977; Sadock, 1974; Wunderlich, 1972, 1976). Our own approach to pragmatics has been based on the assumption that speech acts should be related not only to sentences but also to discourses (van Dijk, 1972, 1976c, 1977a, 1980b). Studying the properties of speech act sequences it was natural in such a framework to postulate macrostructures at the pragmatic level also and to link these with semantic macrostructures of the discourse. For details on speech act sequences and the pragmatic analysis of discourse the reader is referred to this other work.

context, then, is specified in terms of certain properties of the communicative situation: speaker, hearer, their social relations (e.g., of dominance), and a number of their cognitive properties: knowledge /beliefs, wishes/ wants, preferences/ evaluations.

The central idea of pragmatics is the thesis that language not only should be studied as a set of possible (grammatical) expressions with an interpretation but that given the social nature of language we should also study its functioning in communicative interaction. This means that when we *use* language, we not only produce or understand utterances of sentences (with a certain meaning) but *thereby* at the same time may perform specific social actions, such as assertions, questions, commands, requests, promises, threats, and congratulations. By giving specific attention to these actions (viz., the speech acts) and by relating this account of language utterances in terms of their functions as certain actions with the account of structures of utterances given in the grammar, our theory of language becomes more complete a d empirically more satisfactory. It appears, for instance, that many properties of sentences and texts cannot be fully accounted for in morphonology, syntax, or semantics. Perhaps best known in this respect are the syntactic differences among indicative, interrogative, and imperative sentence forms, but the same holds for adverbs, particles, topic and comment structures, presuppositions, etc. For the study of discourse it appears further that the constraints on sentence boundaries in sequences are predominantly pragmatic-besides the usual cognitive constraints on the length and complexity of utterances.

5.1.2. Pragmatic theory is still in its infancy, both in linguistics and in the philosophy of language, where its main ideas originally came forth in the 1960s. Integration with grammar or linguistic theory in general is still virtually nonexistent: Speech act theory has been developed more or less like an independent branch of philosophy and linguistics. Similarly, the obvious links with the social sciences and cognitive psychology have only had very limited attention, although it has been tried to establish systematic links between the philosophy of action and the theory of speech acts.[2] The various theoretical terms, the precise formal aims, and the empirical claims of pragmatics are widely discussed but there is no unified conception about them: What we have just specified as the main aims of pragmatics is one way of formulating the central issues, a way of formulating which especially respects the parallelism with the other (sub-)theories of language which makes eventual connections in an integrated theory easier. For linguistics it is

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[1] See the work mentioned in footnote 1, p. 175, by Austin and Grice and, more systematically, recent work by some German linguists (Brennenstuhl, 1974; Kummer, 1975; Rehbein, 1977).

especially important that pragmatics yields further insight into the structures and functions of utterances; therefore, systematic links between morphonology, syntax, and semantics on the one hand and pragmatics on the other hand must be established.

One of the issues of a theory of pragmatics is its precise 'scope.' One could argue that since language use, action, and communication are involved, these aspects of language study should be studied in sociolinguistics and the sociology of language. Similarly, the use of cognitive terms like the knowledge and beliefs of language users and their attitudes and wishes would necessitate a psychological analysis of language use. This argument is indeed valid from an empirical point of view, and pragmatics should effectively be based on these disciplines. However, just as grammar, including syntax and semantics, is more or less abstracted from its social and cognitive theories, we also consider pragmatics as an abstract subtheory of linguistic theory, studying abstract concepts like 'speech acts,' 'appropriateness,' and 'context' as a characterization of the functions of language utterances. In the same way, a linguistic semantics specifies 'meaning,' 'satisfaction,' and 'possible worlds' for expressions of language, independently of the specific cognitive processes and representations involved. So, *how* language users really interpret utterances as certain speech acts or which grammatical strategies are applied to convey a certain action concept are problems for the cognitive basis of pragmatics.

5.1.3.   It cannot be the aim of this chapter, of course, to give even a brief summary of the main issues and problems of pragmatics. Again, we must focus on the main topic of this book, hence on *pragmatic macrostructures*. We hereby understand the global structures that may be assigned to *speech act sequences*.

That such pragmatic macrostructures exist may already be deduced from the fact that both sequences of sentences and sequences of actions do have them. Therefore, we do not pay extensive attention to the analysis of isolated speech acts but rather see how they connect in sequences and how these sequences are globally organized. This means that we also have to look for the obvious relationship between semantic and pragmatic macrostructures (i.e., between the global meanings of discourse and its global functions as global speech acts or *macrospeech acts*).

Since language is a means of interaction, it is natural to assume that in most situations language utterances organized in sequences are produced by different speakers. Indeed, one of the elementary forms of communication in natural language are several kinds of *conversations* and other dialogues. Such conversations may be studied in their own right and from various points of view. Since sequences of speech acts are involved, performed by different speakers who follow each other by taking turns, a pragmatic analysis of

conversation is also necessary. It is interesting, then, to study pragmatic macrostructures especially for conversation, given the diversity of speech acts, roles of language users, social contexts, etc., involved. By conversation we usually mean the informal everyday speech interaction ('talk'), whereas dialogues occurring in meetings, interviews, hearings, lectures, etc., are taken as other forms of communication.

5.1.4.   Before we go to some further analysis of speech act sequences, some additional remarks are necessary about the basic principles of pragmatics.

First we should repeat that there is a difference between the mere act of 'speaking,' the act of producing (meaningful or meaningless) utterances of a natural language, and the performance of speech acts. Acts of speaking, also called *locutionary acts*, may be accomplished anytime, at will, by a speaker of the language who knows the grammar, etc. Such acts may also be accomplished alone (i.e., without any purpose of being heard or read by other language users). Speech acts, or illocutionary acts, however, are characterized in terms of social interaction and therefore require the presence of a hearer, of certain relationships between speaker and hearer, and some elementary form of interactional purpose: to somehow *change the state of the hearer.*

Locutionary acts are themselves rather complex, and we might at least distinguish between-more or less automatized-morphological acts (saying words) and syntactic acts (categorizing and ordering words and phrases). Further, we also have 'semantic' -also called propositional-acts, which may be taken as specific 'mental acts,' which may be performed by the utterance of meaningful expressions of natural language. Problematic issues are not dealt with here [e.g,. whether we can accomplish semantic acts without (at least tacit) formulations of expressions].

However, we may distinguish between two kinds of 'semantic' acts, between *meaning* and *referring* (or denoting), where the second act presupposes the first in language use. It is now assumed that speech acts are *higher-order acts*, acts which can be performed only *by* the performance of other acts. In this case, both a locutionary act and, *thereby*, semantic acts must be performed for an utterance to qualify as a possible speech act.

Note that speech acts are really *actions* according to our main principles of action stipulated in Chapter 4: They show as specific *doings* (viz., utterances) which are *intended* and which are embedded in a certain *purpose*: We want to inform, promise, warn, or ask somebody *by* the utterance. Similarly, we *interpret* an utterance with a certain meaning, uttered in a particular context, as a certain speech act. In this case we speak of *pragmatic interpretation*. Just like semantic interpretations, these pragmatic interpretations may be formulated in abstract and even formal terms. Cognitive aspects involved are to be accounted for in a theory of *pragmatic comprehension*.

The notion of *pragmatic context* is also an abstraction, the organized set of factors that may in principle determine the appropriateness of a speech act. We thereby use abstract concepts for cognitive states and all kinds of properties of the social situation. Thus, knowledge is a factor in point, because it fundamentally characterizes nearly all speech acts: First, a speaker wants a hearer to *know* something (by the utterance or by the interpretation of the utterance) or wants the hearer to know that he, the speaker, wants to know something (e.g., in questions). Similarly, beliefs, wants, and evaluations are involved. Requests, commands, questions, etc., all typically involve wants, wishes, or preferences of speakers. Evaluations are involved in congratulations and accusations. Further, the speech acts often pertain to the past, actual, or future *actions* of the speaker and /or of the hearer: We criticize or accuse somebody about what he has done, warn him what (not) to do (now or later), promise what *I* will do, threaten what I will do, etc. We see that speech acts are important *organizers* of *social interaction* in general: They inform people about each others past and future actions and tell which actions are wanted, liked, preferred, not accepted, etc. Finally, all kinds of social relationships characterize the pragmatic context: We can only appropriately command somebody if we are in a dominant social relation to him. Similar constraints exist for threats, advice, accusations, etc. Some of the conventional constraints on speech acts have been institutionalized: Only the police may arrest somebody; only a judge may condemn somebody; and only an official of the town or a priest or a ships captain may marry people. We see that all these social conditions are culture-dependent. Thus, there are varying constraints on requests, greetings, etc., in different cultures.

In specifying the appropriateness conditions for a given speech act (e.g., a threat or a command), we enumerate the various cognitive and social conditions that must obtain to accomplish such an act (acceptably), e.g., '*S*peaker knows that *H*earer probably will do *A*, and *S* does not want *H* to do *A*, and *S* knows that *H* does not like *B*, ...,' which would be part of the conditions of a threat, to do *B*.

From this small example we see that speech acts have a *semantic 'content'*, the meaning/ reference of the sentence uttered in the accomplishment of the speech act: We assert, promise, accuse, ask, threaten, command *something or somebody*. This means that much of the information about the nature of the speech act is embedded in the meaning of the uttered sentence(s). So, promises and threats represent (future) actions of the speaker, and accusations or criticism pertain to past actions of the hearer (or a third person). Hence, in speech act comprehension, a hearer is able to assign the correct speech act being performed, by both an analysis of the context and by the analysis of the utterance. In utterance analysis, semantic comprehension plays an important role, because it specifies which participants are involved,

which time and place are involved, and what actions (by whom) the speech act pertains to. This does not mean, by the way, that the analysis of syntax and intonation does not also play a role. Note, that pragmatics is sometimes also considered as an additional component in a theory of *meaning*. That an expression, when uttered, also may function as a promise or a threat may be seen as part of its 'meaning.' At least the assignment of a speech act to an utterance, is also part of the *interpretation* of the utterance. We prefer however not to speak of 'meaning' in this case but rather of *function*. Pragmatic interpretations, then, assign action concepts to utterances and thereby specify why the utterance is used, hence what its (speech act) function is. In other words, we reserve meaning and reference for semantics and action and function for pragmatics.

Finally, another delimitation of pragmatics is stipulated here. We have seen in Chapter 4 that actions have not only results, which are intended, but also *goals*, which are the purpose of the action. The same is true in speech acts. Often, however, we limit our specification of the appropriateness conditions of speech acts to the intention-result pair: Whether a hearer actually believes what we assert, actually does what we request, etc., is not a property of the speech acts themselves but rather an aspect of the further cognitive and social properties of (inter-)action. In some cases, we want to denote speech acts together with their purposed goal (viz., a change in the hearer's beliefs or behavior for example, when we use the concepts 'convince,' 'persuade,' etc). Such acts are called *perlocutionary acts*. They are successful only if their specific goal is realized and therefore cannot simply be performed under the control of the speaker.

Yet, although the wanted changes in hearers do not as such belong to the domain of pragmatics, the assignment of speech acts and hence the interpretation of utterances as certain speech acts should belong to the theory of speech acts, because the utterances are the effected *result* of the speech act. Moreover, although we may well abstract from the specific *points of view* of speaker and hearer, and hence also from their individual intentions and interpretations (of intentions), we should realize that in social interaction, as we have specified before, an action plays a role only as the action it socially *counts as* (viz., on the basis of conventionally warranted interpretations of doings). So, a speaker may have any purpose and intention but must follow the normal conventions in 'translating' them in an appropriate linguistic form, which for the hearer, in a particular context, provides sufficient information for the pragmatic interpretation of the utterance.

We have gone somewhat deeper into this matter of pragmatic interpretation, because the assignment of global or macro- speech acts is of course also a matter of global interpretation of speech act sequences. This also means that the same conversation or monologue may have different global

interpretations of the sequence: What is a threat to one person may be a promise for another, also at the global level of speech act sequences.

5.2. SPEECH ACT SEQUENCES

5.2.1.   In most communicative situations language users perform several speech acts. This kind of ongoing speech activity also allows for analysis in terms of *sequences*; that is, a number of speech acts of certain language users in the same situation may be taken as a unit of which the member speech acts somehow 'belong together,' whereas previous and following speech acts or speech acts by other participants do not belong to the sequence.

Since speech acts are social actions of a particular kind, sequences of them must respect the usual constraints on (inter-)action sequences, as they have been discussed in Chapter 4. First, the speech acts must follow each other in time and must furthermore be pairwise *connected*. Two speech acts are connected if one is a *condition* (or consequence) of the other. Since each speech act, by definition, changes the (pragmatic) context, it is also able to influence the initial successfulness conditions of further (speech) acts. lf we have informed somebody about something by asserting that *p*, the context may have changed such that the hearer after the assertion knows that *p*; this new context would make new assertations of *p* by the same speaker in the same situation theoretically inappropriate. Similarly, one speech act may establish a certain obligation for the hearer, upon which the obligation can be acknowledged or satisfied by a next speech act of the hearer. We see, then, that connection conditions hold both for sequences of the same speaker and for sequences performed by different speakers.

Similarly, we may expect speech act sequences to be *coherent* in other ways. At least, a more or less fixed number of speaker agents are involved, and the speech acts in some, still to be made explicit, way are *homogeneous*. Thus, it is not usually acceptable to both command and apologize in the same context, given the differences in crucial appropriateness conditions for such a communication situation. It should be recalled that since speech acts are based on utterances of (sequences of) sentences, their coherence also requires textual coherence (i.e., semantic meaningfulness of the sequence). Finally, just like action sequences in general, speech act sequences may further be *goal-directed*; that is, the sequence is connected such that each following speech act is accomplished with the purpose and the intention to reach a sequential result or a sequential goal. In certain contexts (e.g., persuasion and meetings) this result and goal may be well-defined (e.g., change the opinion of the hearer or reach a decision together). In other contexts, however, as in everyday conversation, the organization may be much less clearly directed

toward specific results or goals and be confined to the local organization of interaction (e.g., exchange of information or the control of interaction, as in promises, requests, and threats).

5.2.2.   One of the typical ways speech acts may be connected in sequences is by *conditional dependence*. Consider for instance the following simple sequence of sentences:

> (1)   I have no watch. Can you please tell me the time?

When uttered in the appropriate circumstances, the first sentence may function as an assertion and the second, as a request. It is interesting however that in the same circumstances it would hardly be appropriate to just utter the first sentence. It may be, for instance, that the hearer is not at all interested in the fact that the speaker has no watch, as when the hearer is a stranger. The assertion would then lack one of its crucial appropriateness conditions. The request however can as such be performed 'in isolation.' However, a request must be motivated: It must be the case that the speaker cannot himself perform the requested action or give information asked for. The two speech acts together, however, would form a perfectly acceptable combination: The assertion accomplished by the utterance of the first sentence may precisely provide the motivation that may serve as a condition for the request.

   From this example it seems to follow that appropriateness conditions may be *relative*: A speech act may not be appropriate in isolation but may function in a sequence of speech acts. Something similar holds at the semantic level of discourse description: Sentences may sometimes be meaningful, or have a truth value, only in a sequence of sentences. Since appropriateness conditions of speech acts are formulated in terms of pragmatic context features and since (other) speech acts may change the context, it is natural that appropriateness conditions of speech acts may depend on other speech acts in the sequence.

5.2.3.   There are other relations between speech acts in speech act sequences that we may call *functional*, much in the same way as we have done for relations between sentences in Chapter 2. Take for instance the example given in (1) but put the first sentence last:

> (2)   Can you please tell me the time? I have no watch.

We assume that the contextual conditions for this sequence are identical with those of (1). In that case we would have a (pragmatic) variation of style. The difference is that the assertion no longer establishes the correct context for the request but rather afterward supplies grounds for the request and thereby functions as an *explanation* of the request: I ask you this *because* I have no

watch. Thus, assertions about conditions of any kind that are put after other speech acts usually have an explanatory function:

(3) Oh, sorry! I didn't see you.
(4) Stop worrying. He isn't dangerous.

An assertion, request, advice, excuse, etc., may in this way be given further explanation by providing further grounds for performing them.

Another important functional relation between speech acts is the pragmatic correlate of the argumentation schema. Drawing a *conclusion* from previous speech acts, either for oneself or for the hearer, is a well-known relation:

(5) I am busy. So, shut up!
(6) He is dangerous. So, watch out!
(7) You have done your best. So, I'll give you a new bike.

In these cases again the first speech acts function as conditions for the accomplishment of the second speech acts. These however also function as *consequences* that may be stated or commanded in the form of conclusions (see sentence with initial *so*). Note that the first speech acts alone in such cases may *indirectly* function to convey the speech acts performed by the second sentences, given the right context: If we want somebody to shut up, we may (even more politely) just say that we are busy, etc. This means that we leave the obvious conclusion to the hearer, which is often an indication of politeness, because the hearer is, at least superficially, free to draw the conclusion he wants or at least not to follow the suggested conclusion.[3]

Other functional relations are possible (e.g., of correction, contrast, or protest):

(8) Would you like some whiskey? Or don't you like alcohol?
(9) A: What time is it?
    B: But, you have a watch yourself!
(10) A: Watch out for him!
     B: I'm not afraid of him!

These few examples merely have an illustrative function. We want to point out that besides the usual conditional relations between speech acts we may have more or less fixed functional categories. As for sentence relations, no systematic description or theory exists about this kind of relationship. Since this is a problem for the description of local coherence, we shall not try to go

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[1] For a further analysis of indirect speech acts, see Searle (1975) and Franck (1975).

deeper into this problem here. It might only be noticed that functional relationships of this kind may become conventionalized to fixed *schemata*. As soon as the relations hold between subsequences of speech acts in that case, we would obtain *pragmatic superstructures*. In that sense we could see the argumentation schema also as a pragmatic schema, although of course mainly assertions are organized by such schema. The dialogue argument, however, would be more complex and also involve refutations, protests, criticisms, accusations, etc. In the following see whether it makes sense to organize pragmatic macrostructures further in pragmatic superstructures.

5.2.4.   In our examples (1) and (2) analyzed above, there is another aspect that brings us to pragmatic macrostructures. We have seen that the request (about telling the time) might function independently in principle but that it might -especially in polite requests- be motivated further by an assertion about the conditions of the request. This assertion in fact has the function of what we call an *auxiliary action* in Chapter 4. This is one of the reasons why it is not appropriate to perform it in isolation: It makes sense only as a *preparation* or *explanation* of another action. And indeed, the utterance *primarily* functions as a request and not as an assertion. This means for instance that the assertion is a *subordinate* speech act with respect to another speech act and, so to speak 'embedded' in it. So we have *hierarchical relations* between speech acts in sequences, just as we have them between clauses in a sentence. The hierarchy can be established depending on the goals of the speaker: If wanting to know the time is the main purpose, the request becomes superordinate, whereas other speech acts may be taken as auxiliary or subordinate.

It is however not only the case that the sequence is hierarchically organized in that the request is more important than the assertion. We already suggested that *taken as a whole* the use of (1) or (2) may count as a request. In other words, we may apparently assign one *global speech act* to a sequence of speech acts, under certain conditions (e.g., in case other speech acts are subordinate, preparatory, explanatory, or auxiliary). This means that we again need *macrorules* to map speech act sequences on global speech act sequences. Just as for action sequences in general it makes sense, therefore, to introduce the notion of *macrostructure*s in pragmatic theory. Following the theory of action from Chapter 4 this indeed means that we must assume that global actions may be assigned to sequences. Let us examine this assumption somewhat further.

5.3. MACROSPEECH ACTS

5.3.1. We have noticed that certain speech act sequences may be taken, as a whole, as one global speech act. The assumption thereby is that speech act sequences are mapped on global speech acts, by means of macrorules. Such

macrorules delete irrelevant details and generalize and construct global actions. The problem now is how these operations can be specified also for speech acts.

In our previous example we see that if in a sequence there are speech acts that are merely functioning as auxiliary actions for other speech acts, these auxiliary actions may be deleted. On the other hand, if such actions would be considered as normal components, conditions, or consequences of other speech acts, we would rather have CONSTRUCTION. This last rule however involves conventional knowledge about how certain (global) speech acts would normally be performed. Whereas for other global actions (e.g., taking a train or having a party) such constituent components or other properties can be specified, by enumerating the *lower-level* actions that must be performed, such an analysis is more complicated for speech act sequences. Any speech act can in principle *also* be accomplished directly and in isolation: A request need not be performed *by* the performance of other speech acts. Hence, as we do for propositions at the semantic level, we have to argue from another point of view: Given a sequence of speech acts, is it possible to construct a global speech act? This construction may first be based on sequences of *normal conditions*, as in the following examples:

(11)   I need money. Can you lend me a thousand dollars?
(12)   It is very rainy there. So, you can spend your vacation better
         somewhere else.
(13)   Mary just phoned me. John is in the hospital.
(14)   That was a beautiful performance. Congratulations.

In this way, initial speech acts may be performed that establish conditions for the next speech acts: They provide reasons for a request or arguments for advice; they give sources [as in (13)] of information or expressions of attitudes when evaluative speech acts are involved. In general, then, they may progressively change the context of interaction in such a way that a certain speech act becomes not only appropriate but also a 'normal' action. The assignment of global actions however also requires that if such normal conditions are constructed as part of the preparation of another speech act, the sequence as a whole must function as that other speech act. In that sense (11) is a global request; (12), a global advice; (13), a global assertion; and (14), a global congratulation. In a conversation, the respective appropriateness conditions could in this way be 'established,' upon which the speech act 'itself' could even be left implicit or be performed in an indirect way.

For normal speech acts there is probably not a set of conventional *components* of the speech act that are or must be conventionally performed. We can only imagine more or less institutional speech acts that have this property. Official requests, for instance, often need specification of the grounds for the request, all kinds of other statements about future actions, etc.

Similarly, the official accusation in court also should follow a sequence of other speech acts at a lower level. In this case we have not only macrostructures but often also schematic superstructures of speech acts.

Finally, normal *consequences* may be used in the CONSTRUCTION rule, in such cases as:

(15)   Can you lend me some money? I'll give it back tomorrow.
(16)   No, I don't need help. Thank you.

Here, it is the first speech act that also counts at the global level, whereas the second speech act either is an answer to an assumed implicit question of the hearer or has a more ritual nature (e.g., in closing conversational units). In subsection 5.3.3 we see that conditions and consequences of course may have, this function, especially in dialogues.

It follows that certain speech act sequences contain a *main speech act* that at the same time may function as the speech act of the whole sequence if the other speech acts are auxiliary or other subordinate actions. 'Pure' construction occurs only in those cases where the respective speech acts are conventional (or even institutional) components of a global speech act.

Whereas in the previous examples we seem to be at the boundaries of CONSTRUCTION and DELETION, We may also try to find examples where deleted actions are not normal conditions or consequences but really irrelevant other speech acts. The irrelevance may be due to all kinds of ritual interaction, politeness, etc.:

(17)   Good morning. May I help you?
(18)   Hi! How is your wife? Listen, can you come right over and help
       with my car....

Of course, the 'irrelevance' criterion does not mean that the individual acts, at the local level, are not important for social interaction. Only from a pragmatic point of view they do not contribute to the overall speech act being performed by the sequence as a whole. Of course, we may analyze an example like (18) also as consisting of two independent sequences: the first a polite question and the second a request. However, the sequence as a whole (e.g., as part of a telephone conversation) does not focus on the state of health of the wife at all but rather on the request for help. Again this is decided by the global results, and goals of the sequence as a whole. The test for the appropriate macrostructures in this case may again be supplied by a *summarizing description* of the speech act sequence. This could be 'He offered help' and 'He asked for help,' possibly with the specific content of the offer and request.

Finally, we have the GENERALIZATION rule as a possible candidate for mapping speech act sequences onto global speech acts. Here too we have

problems if we do not want to fall into trivial results. We should realize that speech acts are, themselves, actions of a rather specific type. Any sequence would therefore be generalizable to 'He said... ' or 'She just told me....' The question, thus, is whether we have specific concepts for subtypes of speech acts that collect classes of speech acts. Questions, requests, commands, threats, and advice could fall in one class (viz., the class defined by the contextual feature 'Speaker wants the hearer to do something'). Such classes could be referred to by concepts like 'ask' or 'tell.' We see, however, that except for some cases the GENERALIZATION rule is not very productive in the formation of global speech acts.

5.3.2.   An obvious but important kind of global speech act formation is the one that is based on sequences of *identical speech acts*. If somebody makes a sequence of statements, we may also globally take the sequence as a statement. The same holds for other speech acts. Certain utterance types are even defined in terms of this global speech act: A lecture or scientific paper thus functions as a global assertion. However, as soon as we take other speech act types, we see that it is seldom the case that *only* requests, commands, advice, accusations, or threats are performed. Such speech acts also need assertions to provide grounds, explanations, preparatory remarks, etc., for these speech acts, so that again CONSTRUCTION or DELETION applies.

5.3.3.   After these theoretical remarks about the possibility of having pragmatic macrostructures and after the analysis of some preliminary examples, let us now try to apply the macrorules to a more complex sequence of speech acts, viz., those occurring in the interaction of a *conversation*:

(19) (a) A: Hello?
  (b) B: Hi, Sue, This is David!
  (c) A: David! How are you? It's a long time....
  (d) B: Yes. How are you doing?
  (e) A: Fine. Thank you. I have a new job, at the public library.
  (f) B: Nice to hear that. You like it?
  (g) A: Very much. The people are nice there. How is your studying?
  (h) B: Hope to be ready next fall.
  (i) A: Already?
  (j) B: Yes. And that is also why I phoned you. Do you still do typing in your spare time?
  (k) A: Sometimes, when I need some extra money. Why?
  (l) B: Well, you see, I have nearly finished my thesis, and it must be retyped, and I have no time myself....
  (m) A: How long is it?
  (n) B: Two hundred pages.

> (o) A: When must it be ready?
> (p) B: By the end of September.
> (q) A: OK, I'll do it.
> (r) B: Oh, that's nice of you. Do you really have time?
> (s) A: Really, don't worry. When will I receive the manuscript?
> (t) B: In two or three weeks, I think. Would that be all right?
> (u) A: Yes, I'll be there. Phone me before you come ....
> (v) B: I'll do that. Thank you for your help.
> (w) A: You're welcome. I am glad to help you with it. Hope to see
> you soon!
> (x) B: Yes, I hope to see you too. Take care.
> (y) A: Bye.
> (z) B: Bye, Sue.

Clearly, this is a constructed and not a natural conversation.[4] Many properties of spoken interaction in everyday talk have been abstracted from: overlap, 'unfinished' sentences, corrections, partial misunderstandings, etc. Our point, however, is the speech acts involved and what is 'going on' here at the more global level.

Intuitively, reading this conversation we interpret it primarily -at the pragmatic level- as a *request* of *B* to *A* to type *B*'s thesis. This global request is carried out in 26 dialogical turns. This means that we must apply certain rules that make all 26, with at least half of them performed by *B*, count as a global request. Such rules would apply to the respective speech acts, of which several may occur in each turn. These speech acts in our example are the following:

(20) (a) A: Summons.
       (b) B: Greeting. Assertion (Identification).
       (c) A: Exclamation. Question/Greeting. Assertion (Evaluation).
       (d) B: Acknowledgment. Question.
       (e) A: Assertion. Thanks. Assertion.
       (f) B: Assertion (Evaluation). Question.
       (g) A: Assertion. Assertion. Question.
       (h) B: Assertion.
       (i) A: Question.
       (j) B: Assertion. Assertion. Question.
       (k) A: Assertion. Question.

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[1] The empirical investigation of natural conversations is not the task of this section. We merely want to demonstrate that conversations, taken as sequences of speech acts, may have pragmatic macrostructures. For other properties of conversation we may refer to current work in conversation analysis, such as Sudnow (1972); Turner (1974); Sacks, Schegloff, and Jefferson (1974); Schenkein (1977); and Franck (1979).

(l) B: Assertion-Assertion-Assertion (Explanation).
(m) A: Question.
(n) B: Assertion.
(o) A: Question.
(p) B: Assertion.
(q) A: Assertion/ Promise.
(r) B: Assertion (Evaluation)/Thanks. Question.
(s) A: Assertion (Reassuring). Question.
(t) B: Assertion. Question.
(u) A: Assertion/ Promise. Suggestion/Advice.
(v) B: Announcement. Thanks.
(w) A: Assertion (Acceptance/ Reassuring). Assertion (Reassuring). Assertion/ Request.
(x) B: Assertion (Acknowledgment). Greeting.
(y) A: Greeting.
(z) B: Greeting.

When we look at this list and compare it to the actual utterances of the conversation, we first notice that it is by no means easy to assign specific speech acts unambiguously. In many of the examples, we have the very 'general' speech act of assertion, but we know that at the same time something else is being done: We reassure somebody, acknowledge something, etc. lf we would have conventional terms for the various speech act subtypes, our sequence would not have, as it does now, the rather straightforward question-answer (assertion) structure. Similar complications are possible at other levels of analysis. For instance, there are several local strategies of the participants that would need further analysis. Thus, (20, w) exhibits a final assertion, expressing a wish of *A*, which not only is the ritual speech act of the taking leave section of conversations but at the same time may be a real request by *A* to see *B*, hence an invitation to see her earlier, or more often, and not only at the occasion of handing over the manuscript of the thesis. We further neglect all the various details and strategies at the local level.

Globally, we may distinguish between several 'parts' of the conversation. These parts may be based on 'content,' that is, on *topics* that need explication in terms of semantic macrostructures or that have schematic nature. We come back to this superstructure of conversation later, but it is clear that we may distinguish the initial and final greetings as parts that may be distinguished from the other parts of the conversation; and the same is true for the various 'central' segments of it.

Important for our discussion about pragmatic macrostructures is that although the conversation as a whole may be interpreted as a global request of *B*, the request is not even locally made in a direct way. At turn (20, 1) *B* only makes a number of assertions that may, together, count as an *indirect* request at the local level. The speech acts that precede it, however, globally also

belong to the request because they *prepare* it. Thus, first we have the exchange of identification, which is normal in phone calls (except for people who know each other's voice very well and often talk on the phone together). Then, there are the greetings that belong to the ritual social frame of conversational interaction. These greetings, as we see, may go over from a formal 'How are you' to the more emphasized version that needs an explicit answer and then to the request about what the other is doing these days. This constitutes the first section of the phone conversation between people who haven't seen each other for some time. Among other things, it serves to update the mutual knowledge about each other and also to discover whether the other has recent experiences that are material for conversation. In this case, it is the new job of the girl and the stage of the boy's studies. In turn (20, j), *B* then strategically links this introductory part of the conversation with his 'point' (viz., the global request) and then begins the various speech acts that constitute the actual request. To make an adequate request, the speaker must believe that the hearer can or wants to comply with the request in principle. To have this information, *B* therefore asks a preparatory question, as in (20, j). This question is answered more or less affirmatively, but with some reservation, ('sometimes,' 'when I need money'). This allows the hearer to back out, eventually if necessary. The affirmation is then followed by a 'Why' question. This shows for instance that speech acts are seldom accomplished just for their own sake, so if *B* needs information and therefore asks something, and it is not obvious what the information is needed for, the hearer is usually allowed the question about the further *purpose* of the speech act. In this case, it could have been that at this point the girl could have *facilitated* the request sequence by guessing why the boy asks her, given the information about the studies of the boy; he probably needs somebody to type for him. But, since the possible request in this case is not delicate (like asking for difficult help or for a large sum of money), the girl can safely provoke a more explicit request move [viz., the indirect request accomplished by *B* in (20, l)]. In that indirect request, *B* specifies the thing he needs (something typewritten) and the occasion for that (finishing his studies and writing a thesis), which is also a motivation. At the same time *B* provides the further information about the 'non-self-sufficiency' condition of requests: It must be clear that the speak cannot easily accomplish the requested action himself. We thereby have the necessary crucial conditions for the request, and the hearer is able to construct the global speech act concept: *B* is now requesting me to do *p*. Before directly agreeing to comply with the request, *A* initiates two intermediary sequences [viz., in (20, m) and (20, o)] to make sure that compliance does not cause unwanted duties: The task must be feasible. In fact these two questions are in turn preparations for her global act of agreement or acceptance, explicitly expressed in (20, q). This kind of agreement may also be implicit, e. g., by asking the questions (20, m) and (20, o) and after that by directly going to the

arrangement of the actions that would follow an accepted request. The acceptance by *A* must however be acknowledged by *B*, as in (20, r), and in the same turn *B* tries to know whether the acceptance is serious and does not imply too heavy duties, which would cause (too) heavy commitments for the one who is making the request. This 'making sure that all is fine' move by *B* is signaled by the *really* in (20, r), which reappears in the reassuring answer of *A* in (20, s). In that same turn *A* not only reassures *B*, and thereby closes the actual request sequence but also starts the postrequest sequence (viz., the organization of future actions that are involved in the accepted tasks). Necessary information is acquired and given with the additional establishment of security for the future situations of the requested action (it could be at a time the hearer would not be there but on a vacation). Then, we have the usually thanks-acknowledgment sequence, the latter part of which is rather explicit in this case. It seems to imply that the request is not complied with by mere politeness but rather because of friendship. This could also be done in a more subtle and indirect way -e.g., when *A* would say something like: *"It suits me well; I could use some extra money."* This would mean that the one who requests would not need to feel that somebody is only doing something for him but that the help is shared and hence does not involve additional commitments (besides the money).

Then, finally, we reach the opening of the terminal part, with (more or less) ritual expressions about hoping to see the other soon and then the usual greetings, which also close the conversation.

From this simple and stylized example we see one of the ways global speech acts my be performed in a conversation. First, there is a number of (sub-) sequences who prepare the actual core speech acts. Their *function* is to establish the information for the speaker that he needs to make 'safe' speech acts, that is, speech acts that are not embarrassing for the hearer (e.g., ridiculous or tactless). At the same time they allow the hearer to make a hypothesis about the 'point' of the speaker's speech acts, the pragmatic macrostructure now under construction. This hypothesis, as we see in more detail in Chapter 6, is important not only for the comprehension and the organization of the local speech acts but also for the strategically right response to the global speech act, in this case the request. If for instance the hearer guesses what may come, he might already establish a context where the core speech acts for the global speech acts could not be appropriately accomplished. This could happen by denying or not clearly affirming the necessary conditions of the request. In our case, for instance, by an utterance such as *"Yes, but I am pretty much tied up with my work of the library"* after (20, j).

After this initial section of the global request we then have the core speech acts, which directly express the needs of the speaker and other important appropriateness conditions. Then we have the closing sequence of the global

speech act, with all kinds of thanking, making sure, reassuring, etc. Their functions are mainly the right embedding of the speech act, here the request, in the social interaction: not putting unwanted obligations on somebody nor creating feelings of guilt in the other, etc., and to be polite or kind in general. Of course, the reverse may be true in situations of conflict. For those global speech acts that regulate future interaction we have a final section in the central sequence, viz., the organization of future interaction pertaining to the commitments engaged in.

We see that these successive *stages* or *phases* of the global speech act are accomplished by several speech acts in several turns, often question-assertion (answer). Of course, in other examples, many other combinations of speech acts are possible, like question-accusation-defense triples:

(21) (a) A: Pete, did you break the plant?
      (b) B: Uhh, which plant? ... No. Oh no!
      (c) A: Oh come on! Of course you did it.
      (d) B: But, I didn't do it on purpose.
           (…)

Also the sequence may be much more elaborate and as such institutionalized, like in court trials, where accusation and defense may become highly complex.

5.3.4.   It should be noted that until now we were speaking about 'the' global request of the conversation. First, a conversation or other discourse may also have several global speech acts performed by the same speaker. Second, we should remember that, especially in conversation, we do not merely have speech acts but speech interaction, and therefore either we must say that there is a *primary* global speech act, of one speaker, such that the other participant is involved by *cooperation* in the successfulness of this global speech act or we must assume that in conversation each global speech act has also a global counterpart, resuming the speech acts of the other participant. In our case this would be the global 'acceptance' or 'agreement' of *A*. Since in this case it is one of the speakers who has a clear plan and purpose in mind (see below), we could indeed say that the primary global speech act is the request, in which the other speaker is cooperating in order to realize the result and the goal of the speaker who took the initiative for the global speech act. There may also be cases (e.g., in threats or commands) where the primary global speech act of one speaker does not require the cooperation of the other speaker, whereas in common decision making for instance the cooperation at the same level is essential.

5.3.5.   Example (19) is typical in another sense. Contrary to many other kinds of everyday conversations, it must be globally *planned* by *B*: He phones

A with a specific request in mind. This means that *B* follows a specific strategy to arrive at a certain global speech act result (having requested something from *A*) and with the purpose of reaching a certain goal (having something typed). Of course, *B* cannot plan the conversation at the local level, because he does not know whether *A* will be at home and what *A* eventually will say in the conversation. In any case, each speech act of *A* requires the appropriate reaction of *B* at this local level. Only by initiating the respective phases and moves for the construction of the global speech act allows him to *control* the conversation by giving it a specific orientation. We have seen that it is possible that the conditions are not satisfied for the global speech act, and in that case *B* will have to give up or change his plan. We discuss some further details of this planning and strategies of its execution in Chapter 6.

5.3.6.   We finally have to see whether the respective *macrorules* corroborate the more or less intuitive analysis we have made of our example conversation. Given the nearly 50 speech acts accomplished by both *A* and *B* together, how do we arrive at the global speech act?

To apply the macrorules we must be aware of the fact that abstracting from local detail takes place with respect to the sequence as a whole. This does not mean that certain speech acts are not relevant or even necessary at the local level. Also it should be repeated that macrorules are only theoretical operations. They define the pragmatic point of the sequence and assign global speech acts. They do not delete actual speech acts but only say that certain speech acts are not, less, or only indirectly relevant for the global speech act.

In this way, we may first delete the initial and final greetings: They are merely the social and ritual expression of the beginning and end of certain verbal interactions. The same holds for the second subsequence, beginning with turn (20, e): It may be deleted because it is neither a semantic nor a pragmatic interpretation condition for the following speech acts.

At the end of turn (20, j), then, we reach the first speech acts leading to the core of the global request. Since they establish the preparatory conditions for the speech act, they may be taken care of by the CONSTRUCTION rule (viz., as normal conditions). Also the questions and answers of *A* in this case may be taken as (necessary) components of the ongoing global speech act taken as an interaction. They supply the necessary information for making the request and at the same time establish the factual results that make the global speech act successful. From (20, r) on, we then obtain the normal consequences of the request, which therefore also may be taken up in the global speech act due to CONSTRUCTION. The first set of consequences are the thanking and 'making sure' moves of the speaker who makes the request after the acceptance of the request by the other speaker. The second set of consequences is the pragmatic preparation of the realization of the goal and hence also belongs to the consequences that define the strong successfulness of the global request.

Instead of going directly to the global request as it is executed by *B* and accepted by *A* at a lower level we may also construct the following global speech acts:

(22)   (a) *A* and *B* greet each other.
       (b) *A* and *B* inquire after each other's present 'state.'
       (c) *B* asks *A* to type his thesis.
       (d) *A* agrees to type the thesis.
       (e) *A* and *B* make practical arrangements for future execution of the request.
       (f) *A* and *B* greet each other.

We see that we may also distinguish types of interaction that are not one-sided speech acts but rather *interactional speech acts*, such as 'making arrangements' and 'greeting each other.' Many global speech acts have this nature: to argue, to make decisions, to deliberate, etc.

5.3.7.   As in the case for semantic macrostructures, the pragmatic macrostructures are also important for the establishment of *local coherence*; that is, the subsequent speech acts must not only be connected as in question-answer pairs such as (20, m) and (20,n) but often their coherence should (also) be established via the pragmatic point of the sequence. Thus, we can only understand why (20, m) can follow (20, l) if we assume that *A* understands that *B* is making a request, such that *A* needs to acquire the necessary information to be able to comply with it. The same holds for (20, q), which as such is not connected with (20, p) but the expression of the agreement of the request. Note that although we could call (20, 1) *topical* in the sense that it is the core (indirect) speech act (viz., the request) of the global request, it is not sufficient as such to make the global interpretation possible. This is because *A* needs further information before she can accept, so that (20, m)-(20, n) also belong to the request making and acceptance.

   We may conclude indeed that the sequencing of pragmatic moves of speakers in conversation is determined by the local strategies of connection and coherence and at the same time by the overall plan and interpretation of the global speech act. Only in the latter perspective we can explain the *direction* taken by the participants in their respective speech acts.

5.3.8.   Global speech acts must have global propositional content. In other words, *pragmatic macrostructures require semantic macrostructures.* We here find an additional justification for distinguishing global meanings in

discourse and conversation. Indeed, in our example conversation, there is even no direct expression of the semantic macrostructure. Nevertheless, the global request has as its global content '(*B* asks *A*) to type his thesis.' The converse is also true. If a discourse has a global semantic content, we should ask what the global pragmatic function of this topic or theme is. We need information about the *point* of the utterance: *why* it is said. The global function is provided with the global speech act performed. Indeed, the global (implied) information '*B* 's thesis must be typed' is relevant only within the context of a request.

The interesting theoretical conclusion from this observation is also that it may be the case that *the formation of semantic macrostructures is determined by the pragmatic constraints of the context*. We assume that motivations, plans, interaction, and goals are often primary and hence also the speech acts that are part of the interaction. What is relevant to the content, then, and hence also to the semantic macrostructure, depends on the specific global speech act(s) that must be performed. In our case, for instance, without the global request involved, we might also assume until (20, 1) or even (20, p) that the global speech act is an assertion or a complaint of B about the difficulties around his thesis, although the last question in (20, j) would hardly fit such a theme and point. In that case, the question could be detected as being irrelevant at the global level and only locally meant to obtain information about *A*'s actual activities. As soon as the global request must be established, such a sentence would, as a request, be a normal part of the preparatory conditions of the global request and would therefore become more important.

With these few examples, we again witness the fact that macrostructures in discourse and action are not only very similar but at the same time are closely connected in verbal interaction. Global themes must have a global point and vice versa. We must know what people are talking about and what their interactional intentions (plans) are when they do so. This is important also for further interaction. Whatever the details of the conversation as such, *A* only needs to know later that *B* 's thesis must be typed and that *B* requested her to do it. The rest are irrelevant details at the local level or are components of the global information.

It goes without saying that our theoretical analysis of pragmatic macrostructures and their links with semantic macrostructures has not been very explicit, due to the well-known limitations of a formal analysis of language meaning and action. The principles however seem to be clear. Note though that our analysis is rather abstract: The real complexities lie in the various cognitive processes of planning, executing, control, understanding, etc., of global speech acts and their links with global meanings of discourse, which we briefly discuss in Chapter 6.

5.4. PRAGMATIC SUPERSTRUCTURES

5.4.1.   We have already briefly suggested that sequences of speech acts may also have functional roles or be inserted into global schematic categories. This means that pragmatic macrostructures may also be further organized by what may be called *pragmatic superstructures*. Such structures, then, are the overall organization of (sub-) sequences of speech acts in *conventional speech act sequences*, such as everyday conversations, meetings, arguments, interviews, court trials, parliament deliberations, lessons, and lectures.

The corresponding semantic macrostructures of conventional discourse types are discussed in Chapter 3. There it is already observed that some of the schematic categories involved, such as the Conclusion of an Argumentation or the Discussion of an experimental paper, at the same time have certain pragmatic aspects: Concluding, discussing, opening, and closing are also actions and sometimes even speech acts.

5.4.2.   Everyday conversation has a rather clear schematic superstructure. First, we have *Greeting* for the various opening greetings and similar speech act moves, including perhaps a subcategory of *Inquiry*, in which the participants ask about each other's health, present activities, or past experiences. After that the real (planned or not planned) main *Topic* of the conversation may be initiated. This major category may be further subdivided by several categories, such as *Topic Identification*, which functions as the category which focuses attention of the major theme and point of the conversation. We then have the *Topic Discussion* itself, which may take embedded arguments or narratives, accusations and defenses, or congratulations and thanks. Topic Identification in our example begins in (19, j), after which all the speech acts of the Topic Discussion follow: They are all directly or indirectly related to the (global) request. Finally we have *Topic Closing*, which may be accomplished with *Thanks* in our case, after arrangements for the execution of the speech acts that were the point of the discussion. Note that schematic superstructures at this pragmatic level of analysis pertain to speech act sequences. This does not mean however that they do not at the same time organize the semantic content of the sentence sequences: Speech acts can only be performed via the utterance of these sentences. Our notion of 'Topic' here therefore includes the global speech act and at the same time the global theme.

Conversations are not simply closed by the (terminal) Greeting category but rather by a more or less complex sequence of moves, involving the 'beginning of the end': One of the speakers announces directly or indirectly, that he thinks the conversation should come to an end, as in the final sentence

of (19, w) uttered by A.[5] This move may be acknowledged, and only after that do we have several kinds of greetings and definite closing of the conversation. Before this, however, one of the speakers may suddenly think of something relevant to say and then start a new Topic category, which therefore must be recursive. Belonging to the global terminal category of the conversation, we also may have an initial subcategory that contains speech acts arranging future meetings, interaction, etc. The last sentence of (19, w) is a brief example in case.

Our discussion about conversation here does not focus attention on the various properties of conversations as such. We take a conversation as a sequence of speech acts, having a global pragmatic point and a schematic superstructure organizing it. We have neglected all kinds of local strategies and problems of local coherence and connection and have left undiscussed the important *turn-taking* system of the conversations in everyday life. Our example is constructed also in that sense: Turns are changed more or less 'regularly,' after one or several sentences and only sometimes after a major category within a sentence. That leaving a turn to the other speaker may have a strategic function may be seen in (19, 1): The speaker B does not finish his sentence (hesitates, leaves a pause, etc.), so that he need not make the explicit request, leaving the initiative to A. For the general discussion of global structures in discourse and (verbal) interaction, the schematic superstructures of pragmatics play an important role: They are the conventional categories that globally organize both the semantic and the pragmatic macrostructures and provide the broader framework for the superstructures discussed in Chapter 3.

5.4.3.   Similar schematic superstructures can be established for other conventional speech act sequences, whether institutionalized or not. Variations on the everyday conversation for instance are 'arguing,' in which a global category of *Conflict* would organize the accusation/ reproach and defense speech acts involved, and the more formal conversations we may have with a boss or an important politician. Differences need not be at the level of schematic categories but rather at the local level: longer introductions, openings or closings, more polite questions and answers, presence of specific speech acts, etc.; in other words, this may be a difference of style as soon as the social context (see Chapter 4) changes.

The *formal meeting* (e.g., of the department in a university) also often has schematic speech act structure, which again may vary across cultures,

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[1] A well-known analysis of this kind of 'opening-up closings' has been provided by Schegloff and Sacks (1973).

institutions, and social context. In general, however, they are officially opened and closed by a chairperson. This means that certain schematic categories are to be constrained for speech acts accomplished by speakers with certain rules, positions, or functions. After the *Opening*, then, for instance we have a category of *Assessment*, during which the protocol of the previous meeting is established as being correct. After that all kinds of Information may be given [e.g., by the Chairperson (of a board)] with respect to previous decisions carried out, letters sent and received, the actual state of the group or organization, etc. The central part of the meeting, however, is the Topic Discussions which is mostly a recursive category. This category may have a complex internal structure, often of an argumentative schematic structure. The conclusions drawn by the various participants from their arguments may be proposals for the meeting for the next main schematic category, the *Decision*. We see that in this case the global speech act of decision also functions as a conventional category: It is the central result of meetings. After (various) Decisions, then, we reach terminal categories, such as a final round of Questions among the participants and Closing by the chairperson.

In a similar way we might detect conventional or even institutional categories in lectures-we see some aspects of these in Chapter 3 in the scholarly paper and argumentation schemata-preachings or whole religious rituals, and court trials or their global components, such as the accusation and the defense, public debates, and drama's. We cannot, however, provide the details of these various schematic organizations of speech act sequences. We only want to show briefly that pragmatic macrostructures are also further organized by conventional categories, which define the overall 'syntax' of the sequence as well as the specific type of speech interaction involved. We also observe that pragmatic schemata and the links between meaning and speech act functions in discourse. In this way each discourse may be organized at the global level in four ways: semantic macro- and superstructures and pragmatic macro- and superstructures. In Chapter 6 we show that this kind of global organization plays a decisive role in the planning, execution control, understanding, memorizing, and application of discourse and interaction.

5.4.4.   At the end of this last 'structural' chapter we would like to stress that we do not claim that we have arrived at a full-fledged, explicit theory of global structures of discourse, interaction, and speech acts. However, we have shown that such structures, both macrostructures and superstructures, can successfully be distinguished and that there are rules with which they can be semiformally derived from action or sentence sequences. We have also shown that the local structures of action and discourse cannot properly be understood without making reference to their global structures. The various

theoretical concepts were developed in view of the explication of several intuitive concepts, such as 'topic,'' theme,'' point,' and 'schema,' which play such an important role in the natural planning, execution, understanding, and description of discourse and interaction. We have seen that the basic principles of macrostructure formation hold both for discourse and for (inter-) action, both being 'expressions' of underlying 'meanings,' as is particularly clear in the analysis of global structures in speech act sequences, where discourse and (inter-)action are interwoven. Finally, we observe the close relationship between pragmatic macro- and superstructures on the one hand and semantic macro- and superstructures on the other hand. This seems to suggest that our analysis has been systematic enough, so that the mutual dependencies of discourse and (inter-)action, form and content, and content and function are well exhibited.

These conclusions should not hide the fact that perhaps other kinds of global structures in discourse and (inter-)action could be discovered in the future. We do not claim that all aspects of macrostructures have been discussed. Especially for specific discourse and interaction types it would certainly be necessary to develop further macroconstraints or to analyze further schematic superstructure categories. We have not discussed the kinds of 'symbolic' or 'other higher-level (or 'deeper') kinds of global notions associated with discourse and interaction; we think however that these might be accounted for in terms of the basic semantic and pragmatic principles discussed in the last few chapters.

We call Chapters 1 -5 'structural.' This means that we have only discussed more or less abstract structures of discourse and (inter-)action, viz., from the point of view of linguistic and social theories; that is, we have abstracted from the actual cognitive functioning of macrostructures to which we turn now.

6 Macrostructures and Cognition

6.1. THE COGNITIVE BASIS
OF MACROSTRUCTURES

6.1.1. It is argued repeatedly in this book that macrostructures have a cognitive basis. In the analysis of global meanings of discourse and of global (inter-)action we gave a more or less abstract structural analysis of macrostructures, thereby abstracting from the representations and processes underlying the formation, execution, interpretation, and storage of macrostructures in memory. We showed that the local analysis of discourse and action cannot be adequate without an additional account of global organizational principles of sequences of sentences and actions, but we ignored the cognitive principles involved in this aspect of complex information processing.

In this chapter, then, we focus attention on the more specific cognitive aspects of macrostructures. In many respects the distinction between the more abstract, structural account in the previous chapters and the treatment in this chapter is arbitrary. First, cognitive models are also abstract theoretical constructions, needed to account for all kinds of meaningful behavior as it is involved in language use and interaction. Second, our structural descriptions and macrorules in the previous chapters partly also, play a role in the representation of macrostructures in cognition. Linguistics, sociology, and cognitive psychology clearly overlap in this respect: They each present their own theories of language use and (speech) interaction.

Nevertheless, empirically the interpretation of discourse and interaction is accomplished by language users and social participants, and therefore the linguistic and the sociological theories need a cognitive basis. The cognitive

model has to specify how macrointerpretations are actually carried out, what processes and phases are involved, what the representations of macrostructures are in memory and, how they influence the processing of microstructures. Roughly speaking, then, this chapter is about various kinds of cognitive *processes,* to be defined in terms of concepts of a cognitive theory, such as properties of memory, production strategies, inferences, knowledge and other cognitive systems, storage, capacity limitations, retrieval, and reproduction.

Another important aspect of a cognitive analysis of macrostructures pertains to the various structures, systems, and representations that influence the various macroprocesses. Not only our knowledge and beliefs are involved, as we saw earlier for the assignment of global structures to discourse and interaction, but also such factors as wants, wishes, preferences, interests, tasks, purposes, attitudes, values, and norms. The set of factors that in a particular context of action or discourse processing, influences macrostructures is called the *cognitive set* of a language user or participant. Thus, it is plausible to assume that if a language user has specific interests or tasks, the formation of topics during comprehension of discourse may be different from that of other individuals with a different cognitive set. This assumption is discussed briefly in this chapter but without the necessary extensive treatment of the nature of the various factors in the cognitive set themselves. We pay attention primarily to the role of *knowledge* and *beliefs* in macroprocessing. Theoretical and experimental work about the interaction between the other factors of cognitive set and macroprocessing is a major topic of *cognitive social psychology*, which needs treatment in future research in that area.

Another restriction of this chapter is the primary focus on global processes: The cognitive processes involved in the production, execution, comprehension, and storage of local (micro-)structures is neglected. Such a study would involve most of current work in cognitive psychology, artificial intelligence, and psycholinguistics. We therefore must single out the more specific, though fundamentally important, aspect of global processing of complex information. How actions and discourses are understood and produced at the level of elementary doings, words, phrases, and sentences therefore is outside the scope of this chapter. We only pay attention to the ways microstructures are linked to macrostructures.

Finally, two other important areas of a cognitive theory of macrostructures are neglected, viz, the *acquisition* of macrostructural principles (rules, strategies) and the *psychopathology* of global processing, such as aphasic or schizophrenic conditions restricting production and comprehension at higher levels and the transition from micro- to macrolevels in various cognitive domains such as discourse and interaction. Although these areas are very important, also for gaining insight into the 'adult' and 'normal' functioning of

macroprinciples, the current data and theories in these domains about macroprocessing are too scanty to provide suggestions for appropriate models of semantic development and semantic pathologies.

6.1.2.   The basic idea of this chapter is the following: Complex information, such as that involved in the processing of discourse and social interaction, must be *organized* and thereby reduced through the construction of higher level, global structures. More specifically, it is assumed that agents when engaging in complex social interaction must form *plans* that organize and control the execution of their local actions. This also holds for the planning and execution of speech acts and discourse. Conversely, in comprehension and memorization, to be able to understand and to store complex information from action and discourse, language users and participants need to assign global structures to the complex semantic input: They look for or construct themes, topics, gist, point, and the schemata organizing these global aspects of content.

The central problem, then, is how individuals go about doing this, which cues and strategies they use, to be able to perform these highly difficult cognitive tasks.

Although we have focused attention on the important cognitive functions of discourse and (inter-)action, this does not mean that the fundamental principles of macroprocessing do not also apply in related or different areas such as thinking, problem solving, perception, decision making, attitude formation, and evaluation. We only briefly discuss these other domains.

6.1.3.   The idea of global processing of information is not new in psychology. Both in the Gestalt tradition and in more recent work on cognition and artificial intelligence, notions have been used that are similar to or linked with our concept of macrostructure. This chapter cannot discuss these various notions and their historical background and development. To distinguish macrostructures from different though related notions, such as *schema, frame, script,* and *scenario*, we add a section in which various theoretical concepts that seem necessary in an adequate model of (global) processing are tentatively defined. References to specific authors are given in the footnotes and not in the text, to stress the approach taken here, which is focused on the phenomena and the problems rather than on a survey of related work in this area.

The most important historical background for a study of the cognitive aspects of macrostructures should of course be *Gestalt theory*.[1] Notions such

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[1] See Koffka (1935) and Köhler (1940). The idea that cognitive functions, such as perception, should be accounted for also in terms of 'holistic' notions was not unknown before the Gestaltist tradition (Thomson, 1968, p. 245), but we do not investigate these historical backgrounds further here.

as *global, whole*, and related concepts used in this book have received particular attention in that tradition. Although paying attention primarily to the area of perception, the basic idea involved is similar to ours: Against a 'background' and with respect to collections of details, we perceive 'wholes' as specific 'emerging' units of perception. The properties of these holistic units cannot be accounted for in terms of their elements or components; they are more or less autonomous. In the current developments of psychology and artificial intelligence, of course, such metaphorical theorizing is no longer acceptable. However, some of the basic tenets are interesting enough to warrant renewed theoretical and experimental treatment. It is our contention, then, to make a new attempt toward a model of complex information processing (viz., in terms of the 'global' notion of macrostructure). Clearly, such a model must be theoretically explicit and formulated in precise rules, operations, representations, etc.

The obvious links with classical Gestalt theory should not hide the fact that there are also important differences. For one thing, the mysterious 'emerging' of global or holistic units, more or less independent of the more elementary components of these units, is not consistent with our view of macrostructures. These are *constructed,* in comprehension, by specific *operations*, on the basis of local information and of information from our knowledge or other factors in our cognitive set. We thereby hope to give an answer to the justified critical question about the cognitive nature of the 'emerging' processes. Also it should be emphasized that macrointerpretation in perception is only similar to that in discourse and interaction at the more fundamental level; perception involves all kinds of visual features that do not play a role in discourse comprehension and are only indirectly involved in the higher interpretation of social interaction.

6.2. LOCAL DISCOURSE COMPREHENSION

6.2.1.   To understand the processes involved in global comprehension of discourse, we first pay some attention to the local or microlevel. The various problems and notions we meet along the way are then further worked out in the subsequent sections of this chapter.

It is far from superfluous to repeat here that our knowledge about the cognitive processes of discourse comprehension is as yet very limited. We have only a few, rather simple, models, of which some specific predictions have been empirically tested.[2] These models are still relatively abstract. They

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[2]Surveys of discourse comprehension research in psychology have been given in Meyer (1975), Thorndyke (1975), and van Dijk and Kintsch (1977). Thorndyke's bibliography of the area (Thorndyke, 1978) lists several hundred titles. Of the various models actually being proposed, after more occasional work from the 1940s to the 1960s, we may mention that of Frederiksen

specify a more or less 'idealized' comprehension process, neatly working along various phases, units, and levels. The precise interaction of knowledge and other factors that may vary from person to person with this process has hardly been studied in experimental detail, although this is the way discourse is understood and further processed in natural contexts of listening and reading. Although some of our theoretical remarks are based on experimental results in recent cognitive psychology, many others are merely (plausible) hypotheses for a systematic model. Parts of the model are the theoretical units and rules introduced in the previous chapters. What we have to do, however, is to show their cognitive relevance and the way they actually work in processing.

6.2.2.   We begin our discussion with the domain of discourse *comprehension,* which is, whatever little we know about it, still better understood than the process involved in discourse production, a topic we turn to later in this chapter.

To keep our treatment within the size of one chapter, another restriction is necessary. We largely ignore all kinds of surface structures of discourse: phonological, morphological, and syntactic structures. We assume that a language user during comprehension goes through a complex process of analyzing-synthesizing such structures, often at several levels at the same

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(1972, 1975b, 1977), Meyer (1975), Rumelhart (1975, 1977), Kintsch (1974, 1976, 1977a), and Kintsch and van Dijk (1978). The main ideas in this chapter have been developed in van Dijk (1977b, e, 1978b, c, d, e), van Dijk and Kintsch (1977), and Kintsch and van Dijk (1978). In artificial intelligence, comprehension models are due to Charniak (1972) and Schank (Schank & Abelson, 1977). These references are far from complete and merely signal some major directions of research.

Several authors who have written about the psychology of discourse comprehension have also recognized a global, macrostructural, higher-level, thematic, or topical level of analysis and comprehension. Besides the recent work just mentioned, the following papers have discussed these notions earlier. Gomulicki (1956) discusses the role of 'important' parts of discourse, passages and the links between text elements and the 'total meaning' of a passage. Paul (1959) replicating Bartlett's (1932) experiments for different cognitive styles, speaks about 'themes' of a text as 'figures' in the text as a whole. Lee (1965) discusses the role of 'higher-level structures,' expressed by titles, summaries, and conclusions. Pompi and Lachman (1967) introduce the notion of 'surrogate structures' as being a combination of theme, image, schema, and abstracts or summaries and representing the 'essential idea' of a passage. Lachman and Dooling (1968) observe that meaning elements are organized around a 'core' (i.e., a theme or central idea), which, at the same time functions as an executive program. Freedle (1972) pays extensive attention to the topical aspects of discourse. Bower (1974) uses the term 'macrostructure' in which major categories (versus details) are represented. Barnard (1974) speaks about thematically important propositions organizing (sub)units of discourse.

In all these cases, the basic intuitions about higher-level, thematic organizations of discourse are similar; but in no case have explicit representations, rules, or categories been worked out to derive these from actual discourses, as is often the case in more recent work.

time or in a mixed fashion, thereby gradually constructing a *conceptual structure*. We focus attention on this *semantic* comprehension of discourse and make some remarks about processing of schematic superstructures that organize semantic information.

Similarly, here we are unable to provide a full account of the processes involved in semantic *sentence* comprehension, whatever details are well-established about these processes.[3] So, we proceed as if we know how language understands words, phrases, clauses, and sentences and focus on the comprehension of *sequences* of sentences (e.g., the comprehension of connection and coherence relations between subsequent sentences). We also provisionally assume (until Section 6.3) that the language user assigns 'full' semantic interpretation. In reality, however, lack of attention and other factors often leads to fragmentary comprehension.

It has been an important difference between recent cognitive models of semantic interpretation and those in linguistics that 'real' comprehension does not follow the respective units and levels of' abstract' semantic theory. If it is strategically necessary, language users employ morphological information to supply hypotheses about the actual phonological structure ('word expectations') and do the same with syntactic information: Assumptions about the plausible syntactic structure of a clause provides knowledge of categories that in turn restricts the possible morphemes involved.

This is even more interesting at the level of semantic interpretation. Clearly, a language user does not 'read in' a full clause or sentence at the 'surface level' and then start interpreting it. On the contrary, he starts right away with the interpretation of words and phrases and in part makes hypotheses about the further syntactic structure on the basis of semantic expectations. The details of this interaction between levels of sentence analysis are still unknown.

Important for our discussion is the plausible assumption that a similar kind of 'mixed' interpretation takes place at the semantic level itself. It may well be the case that sentences are only fully interpreted, at least sometimes, after the interpretation of following sentences, by correction of interpretation hypotheses, by specification or addition, or by 'wait-and-see' strategy. This assumption holds not only for the local level but also for the global level: Individuals start to make hypotheses about the topic of the sentence sequence right after the interpretation of one clause or sentence and before having the necessary additional information from subsequent sentences. The processes involved here are discussed in subsection 6.2.3. It is only emphasized here that at all levels and for all units or scopes comprehension in natural language takes place by more effective procedures and not in the systematic way of a

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[3]A survey of this work can be found in Clark and Clark (1977) and Levelt (1978). Various Issues of this kind of semantic comprehension are treated in Clarck (1976).

grammar. The same again holds for semantic interpretation vis-à-vis pragmatic interpretation and social interaction: We may predict part of the meaning/reference of a sentence just by knowledge of the assumed or expected speech act performed and of the actual social context.

6.2.3.   Our theoretical model for the comprehension of complex sentences and sequences of sentences are based on the usual basic cognitive notions of *semantic information processing*. This means first that we distinguish between different 'kinds' of *memory*.[4] We ignore the problem of whether these various memories are 'really' existing or whether we should rather speak of different regions, domains, levels, or accessibility thresholds of 'one' memory system. The distinction of different memories is theoretical anyway (e.g., in order to explain differences in the processing and availability of information).

Thus, we need the usual distinction between *short-term* and *long-term* memory, the latter often also called 'semantic' or 'conceptual.' Whatever the precise empirical differences between these two kinds or areas of memory or between the information typically involved in them, it is important for our discussion that short-term memory has serious *capacity limitations*; that is, its storage buffer for incoming information is limited, so that information briefly being stored there is repeatedly renewed. In that case at least some of this information is stored in long-term memory. Short-term memory is a typical *working memory*: It is assumed that surface structure information is assigned here to incoming phonetic or visual strings and that these surface structures are assigned semantic interpretation. It follows that this kind of working memory also must handle semantic information (e.g., in the construction of meanings for sentences).

Long-term memory seems to have two rather different aspects. On the one hand it stores actually processed incoming information, together with kinds of contextual data (time, place, circumstance of processing). This aspect is called *episodic*. For language, episodic information pertains to memory for actually heard/read sentences and discourses, or information derived from them, together with the information about the communicative context. The other aspect of long-term memory is the more *abstract* storage of conceptual knowledge, beliefs, attitudes, etc.: knowledge about the world, rules, grammar, and so on. For brevity of reference we now simply speak of episodic and semantic memory, respectively, although both are part of the same memory system.

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[4]See Norman (1970), Tulving and Donaldson (1972), Cofer (1976), and Kintsch (1977 b) for the details of the summarizing remarks made here. We do not go into the differences between various memory models, nor into the specific problems associated with them. Our own analysis of discourse comprehension does not hinge upon these differences.

6.2.4.   First it is assumed that the comprehension of sentences and sequences of sentences involves the construction of *propositions.* Roughly speaking, propositions are conceptual structures that are the minimal bearers of truth or satisfaction. Thus 'John' is a concept but is not information that can be true or false or satisfied in a more general way; whereas 'John is ill' would be a proposition, because it could be true or false. 'Is John ill?' would also be a proposition, because it can be satisfied or not. We do not go into the philosophical discussion about propositions here. Relevant for our discussion, however, is the *kind* of propositions we would like to manipulate in a processing model. In Chapter 1 we discuss that we may have atomic propositions, e.g., of the form *g(a)* or *h(a, b)*, and also more complex ones involving connectives or even embedded propositions at argument places. A sentence like:

   (1) John thought that Peter was ill.

would in that case have the form: *thought (John, (ill(Peter)),* where one proposition is the (intensional) object of the thinking relation. Next, we have the problem of the various semantic relationships or roles of the respective arguments of the predicate. We have seen that these may be introduced in the proposition by way of specific case labels for the respective arguments or argument places. We have opted, however, for a slightly different approach. Instead of allowing complex propositions with appropriate case marking, we would like to propose to keep only the atomic propositions and to organize these by way of what we have called FACTS. The atomic proposition represents the minimal information that 'holds' about an intended possible world (e.g., the existence of John, the fact that John is ill, the fact that John is calling somebody, and that this is the doctor). Hence, the information of the atomic proposition is located in the predicate, and the arguments are merely variables or constants in a certain ordering. The various functions of the arguments, and the relatedness of the atomic facts that the propositions denote, are made explicit in the conceptual representation of FACTS.
   A FACT is the cognitive representation of an event, action, or state of affairs taking place at a particular time, at a particular place, under particular circumstances, and in a particular possible world. FACTS have a schematic FACT-Structure, as specified in Chapter 1: an Event node, for instance, with various subordinate nodes for the respective individual 'things' involved in the event, and a Setting node, in which place, time, possible world, etc., are specified. When actions are involved, the roles may be those of Agent, Experiencer, Patient, Beneficiary, etc.
   FACTS may also be *complex* -that is, have FACTS embedded at certain points in the schema. Thus (1) would express such a complex FACT, where the

argument node Object would be specified by another FACT (specifying what John thought).

Now, the problem for a cognitive model of discourse comprehension is to know how a language user constructs the respective FACTS. Since FACTS may be complex, we must know when a *complex* FACT is constructed and when a *sequence* of FACTS must be constructed. Take, for instance, the following simple texts, based on the first sentences of the crime story analyzed in Chapter 2:

(2) Ken saw a girl. She was tall and slim.
(3) Ken saw a tall and slim girl.

The second text would be represented by one FACT with two modifiers under the Object (or Patient) nodes. For (2) we may have the same representation or else two separate FACTS, of which the second would be a state description. The two different representations are not simply free variations but may correspond, as the difference in surface structure indicates, to two FACTS. Indeed, FACTS are cognitive units and indicate how information about the world is represented: We may see a complex scene, or a description thereof, either as one 'whole' or as a combination of units, a sequence of FACTS. The difference between the way reality is 'seen' may thus be emphasized by a cognitive representation in different FACTS. In (3) the properties of the girls are more or less 'subordinated,' whereas in (2) they are focused upon at the same level as the first FACT. We assume that there is a comprehension strategy according to which (whenever possible) the surface structure division in clauses and /or sentences is a cue for the construction of the FACT sequence. Now, if the reader considers a FACT expressed by a separate sentence as relevant or important enough he may also represent it as a separate FACT, that is, *accept* the textual cue. However, this *need* not be the case. Strategies in discourse comprehension are not rules that must be followed but expedient procedures to process information. This processing depends on the cognitive set. If in our example the fact that the girl was slim and blonde has, by hypothetical assumption, particular relevance for the reader, another FACT will be construed. If not, the FACT schema allows the reader to construct a FACT with additional modifiers or embedded FACTS. We may call this procedure FACT-*collapsing*. We see that the strategies are really flexible and that is how it should be, because only in that case can different tasks, interests, etc., of the reader be respected. Of course, if *neutral* comprehension takes place, that is a process whereby no *particular* tasks, interests, etc., are applied; the major strategy is that the reader just follows the textual cues; that is, he constructs two FACTS in (2) and one FACT in (3).

It is important to realize that FACT construction is not arbitrary from a structural point of view: FACTS have a definite schematic structure. This schema is an important instrument in the organization of semantic

information. At each point in the discourse, the reader (hearer) wants to establish the event (action, state) now being represented and what the participants and the Setting are. Further specifications of one of the nodes, also in subsequent sentences, may be attached to the respective Modifier nodes.

The organization of propositional information in FACTS is crucial from a cognitive point of view. Sentences may express up to around 20 atomic propositions, as in the first sentence of our crime story. Given the limitations of the STM (short-term memory) buffer, we must assume that such a number of propositions need informational reduction, by organization in FACTS.

6.2.5.   Let us assume that a reader/ hearer starts to read/ hear a discourse, beginning with the first sentence. According to our assumptions just made, this first sentence is comprehended -after a complex interpretation procedure of words and phrases not to be spelled out here- by the isolation of a sequence of propositions. At the same time these propositions are organized in FACTS according to the FACT-schema. The surface structure of the sentence (viz., word order, morphological information, and other syntactic cues, as well as semantic information about the possible role of participants) is used in the construction of the schema. For example, the first noun phrase may be taken as the syntactic function of the subject, and when denoting a human being it may also be semantically interpreted as the Agent of the FACT. Of course, this is only a strategical hypothesis: The rest of the sentence may contradict the hypothesis. The strategy is expedient, however, because the canonical structure of sentences in English allows such a hypothesis.

Once a FACT structure organizing the (atomic) propositions of the first sentence is established, we say that the sentence has been understood (semantically) by the reader/ hearer. Our interests starts from there: How is the second sentence understood and, especially, how is it connected with the first sentence, and what is the role of cognitive memory constraints in this case?

If we assume that the next sentence also has around 20 atomic propositions, and if we further assume that it might be necessary to establish a conditional relation between the whole first sentence and the whole second sentence or to establish coreferential relations to interpret a pronoun in the second sentence correctly, it is clear that the reader must have all the information of both sentences directly available. We assume, then, that the STM buffer always contains the information of at least two subsequent sentences -unless there are obvious cues that these need not be connected (e.g., at the end of a paragraph, section, or chapter on the one hand and the beginning of the next on the other hand).

This means that the STM buffer contains up to perhaps 40 or even more propositions if the two subsequent sentences are rather long and complex. Whatever the precise size of the STM buffer may be, experimental evidence

shows that it cannot possibly contain such a number of semantic units, unless these are organized.[5] We here find a powerful reason why the atomic propositions must at least each be organized into complex propositions with a case frame or else, as we propose, in FACTS.

At this point we would therefore have a buffer contain the *two* FACTS expressed by the subsequent sentences of the discourse, which would be an acceptable first load for the buffer. The next important step in the model would be the connection between the two FACTS, operated by interpretation procedures of STM. We can only speculate about the operations involved at this point. First, we should assume that the establishment of intersentential coherence need not wait until the full interpretation of the subsequent sentence. In example (2), p. 208, for instance, the input and interpretation of *She* as the first word of the next sentence, probably leads directly to the establishment of coreference with *girl* in the first sentence, which establishes identity between the participant nodes in the respective FACTS. Of course, as soon as several participants are involved and the pronoun does not disambiguate the objects or persons, further semantic interpretation is necessary to find the right coherence relations. After this kind of provisional coherence establishment between participants, which may be objects, persons, times, places, etc., it must be determined how the events, actions, or states are connected as a whole. This connection may be indicated by connectives *(so, therefore, after that, but*, etc.) but need not be, as shown in example (2). At that point *knowledge of the world* is necessary to establish what combination of facts can be conditional, what facts are part of a normal sequence or configuration, etc.; that is, we may need *frames* or *scripts* to decide whether the facts are connected or more general knowledge about the normal combination or ordering of events and actions. We return to the role of frame-like knowledge in the comprehension of discourse below. At the same time, as shown in a more abstract sense in Chapter 2, we must assume that it is the *topic* of the sequence that indicates how or why two facts are related. It is at this point where the role of macrostructures in the local comprehension of discourse becomes important. We come back later to the formation of topic assumptions.

After the postulated operations of coherence establishment between the two FACTS stored in the buffer, we now have stored a connected FACT sequence in the buffer: two FACTS related by a number of coherence links. We thereby have to keep in mind that, to be able to establish these links, various kinds of knowledge, from memory, are necessary and therefore that STM also at least briefly has to contain this knowledge. The same holds for the connecting topic (macroproposition). This means that the buffer may have

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[5]In Kintsch and van Dijk (1978) parameter values for the capacity of the short-term memory buffer have been estimated and tested for complex propositions similar to what has been introduced here as FACTS. These values are around a maximum of five units.

two additional semantic units in temporary storage. We briefly ignore how this necessary information is searched for, found, and actualized in and from LTM (long-term memory). Clearly, as we see, the necessary information may also, in the middle of the discourse come from episodic memory about the previous sentences of the discourse or about the communicative context.

6.2.6.   Once a coherent sequence of FACTS is stored in the STM buffer, we have comprehended the two first sentences (or perhaps clauses) of the text and their necessary coherence relations. If the coherence relations cannot be, or only partially are, established, further information from the rest of the discourse is waited for by the language user. Anyway, the reader must interpret the next sentence, as a FACT, and apply the same operations with respect to the previous FACT(S) of the sequence.

However, here the constraints of capacity limitations of STM become vital: we cannot simply add an arbitrary number of new FACTS to the FACT sequence in the STM buffer. So, specific operations are necessary to make room in the buffer so that for each FACT *Fi* in the text base we are able to connect it with *Fi-1,* and/or *Fi+1*, given the abstract coherence conditions formulated in Chapter 2. This process of coherence establishment is *cyclical*. Given a FACT, it must be connected with a next FACT, and the next FACT must again be connected with the previous and the next one, and so on. This means however that as soon as *F3* is to be connected with *F2*, we may no longer keep *F1*. In that case we assume that *F1*, at least partially, is 'moved to' episodic memory.[6] From there it may however be *reinstated* as soon as it is necessary in the interpretation of the following sentences of the discourse. In this way, then, the comprehension process is *pairwise* cyclical: It is geared to establish binary connections between subsequent sentences, given the capacity limitations of STM. Nevertheless, it may be that the process is slightly more complicated. First, if sentences are short enough, it may well be that the STM buffer stores three or even four FACTS, if necessary; that is, it may occur that *Fi* is not connected with *Fi-1*, but with *Fi-2* or even *Fi-3*, as in the following continuation of example (2):

>   (4)   Ken saw a girl. She was tall and slim. She wore a white summer frock.
>   He thought she was sensational.

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[6]Inevitably the model of discourse comprehension features a number of, at most expedient, metaphors (e.g., about the ways information is treated in the memory system). Thus, storing and retrieving information in and from STM or LTM often is described in terms of information 'flow.' As we have remarked earlier, such metaphors need not have direct empirical correlates, ultimately to be justified in terms of neurological terms of brain processes. This means that, at this level of a cognitive model, we might as well speak about varying *degrees of availability*, or similar notions. In our account we assume that the various memory models at this point are formally equivalent.

Clearly, the pronoun *He* in the fourth sentence corefers with *Ken* in the first. This means either that the concept 'Ken' must be reinstated from EM (episodic memory) or that it is still available in the STM buffer. After the first sentence, the text focuses upon the girl, which is the basis for the coherence between the subsequent sentences, and hence also between *S4* and *S3*. However, there is probably an additional strategy. Since *Ken* expresses both the subject and Agent functions in the first sentence, the reader assumes that the story mainly involves Ken. At least in the sequence it is therefore plausible that soon Ken will be mentioned again, so we assume that in the cyclical process of renewing the contents of the STM store certain *presuppositions* of previous sentences are kept in store (e.g., the major participant of the sequence). This allows us, during a certain stretch, to keep a plausibly central participant concept, which may be needed for coherence establishment, by coreference, soon. In fact, this assumption is corroborated by the fact that the fourth sentence in our example indeed uses a *pronoun: he.* Fast interpretation in that case requires that the main participant node is still present in STM. If not, the relevant participant would have to be reinstated from EM. In that case, we often need a full noun phrase (e.g., *the boy*) or if the distance is larger, expressions like *the boy who was looking at the girl*, or *the boy we have been talking about in the beginning of the story.* A simple *he* in that case may either be ambiguous in reference or not be specific enough for the retrieval procedure. It is an empirical problem what the *maximal distance* is between coherence elements of sentences in the same sequence. This depends on several factors such as the degree of prominence of certain participants. This prominence may on the one hand be sequential, like the girl in our crime story fragment, and on the other hand be defined at the level of macrostructures: If a participant is also participant of a constructed MACROFACT, the relevant information is readily available in the STM buffer if we assume that for each sequence of sentences a MACROFACT must be present in the STM buffer to establish both local and global coherence, as indeed we have done and as we further specify.

   The result from this discussion is now as follows: In discourse comprehension, subsequent (pairs or triples) of sentences are interpreted as coherent FACT sequences, which are stored in the STM buffer. As soon as a new sentence is interpreted, a new FACT is constructed, linked with the previous FACT, if possible, or sometimes with the penultimate FACT (or with the MACROFACT), after which the first FACT is stored in EM and the third FACT is stored in the STM buffer, and so on, cyclically. Hypothetically relevant concepts of the first FACT and presuppositions of a sequence in general, which are mostly coreferential concepts, may also be kept in the STM buffer during a number of cycles. Often this concept is part of the relevant macroproposition.

This is, very roughly and informally, the theoretical outline of a model of *local* discourse processing; that is, a model of how readers or hearers link

sentences. The several other factors involved in this process are discussed in the next sections of this chapter.

6.3. GLOBAL DISCOURSE COMPREHENSION

6.3.1.   In Section 6.2 it is observed that the comprehension of local coherence also involves certain aspects of *global comprehension*. One of these aspects is the strategy whereby a reader assumes that an Agent who is the subject of one or several subsequent sentences at the same time is the Agent of an action at a more global level.

Whereas in the structural model outlined in Chapter 2, it is shown that macrostructures are derived from sequences of sentences by certain macrorules, we now must see how this global interpretation takes place in a plausible cognitive model. It has been stressed that in such a model we should not assume that the macroproposition derived from a sequence of sentences is assigned only *after* the comprehension of the whole sequence: A reader makes a hypothesis about the macroproposition that is now relevant as soon as one or more sentences provide enough information to make such a hypothesis. Although we can only make educated guesses about the precise procedures involved, we try to sketch some of the fragments of this 'global' part of the model of discourse comprehension.

6.3.2.   First   it   should   be   recalled   that   the   assignment   of macropropositions to text bases is determined not only on information from the text itself. *Knowledge* about the *world* and the *context* generates rough assumptions about the possible or probable topics of a discourse or conversation of certain speakers. These expectations yield a more limited domain for the hypothetical construction of actual macropropositions: Relevant concepts in that case are more readily available.

Second, extremely important cues may be given by *titles* and *topical sentences*. Hypotheses about the topic of a discourse are established more specifically by the interpretation of such expressions. Thus, titles may provide information about the topic of the text as a whole and topical sentences about a following paragraph or section of a discourse[7] Clearly, this only holds for written discourse. In oral communication, these expressions may occur in announcements or other types of prediscourse elements: *Did you know that...? Did I tell you about...?* etc. In other words, even before reading the first sentence of a discourse the language user may already have a domain of possible macropropositions or even general or more specific macroproposi-

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[7]The influence of titles and similar macrostructural expressions has been repeatedly mentioned in the experimental literature on discourse processing. See Dooling and Lachman (1971) and Kozminsky (1977).

tions. This allows him to comprehend the first sentence of the discourse directly with respect to the major or subordinate topic and also in those cases where the sentence as such would not contain enough information to warrant the hypothesis about a particular topic.

6.3.3.   Proceeding to the interpretation of the first sentences of the discourse, the reader first goes through the operations about local comprehension described in subsection 6.12: A coherent sequence of FACTS is constructed and stored in the STM buffer. However, we see that the establishment of coherence may depend on the topic of the sequence, and therefore a reader must make a hypothesis about the actual macroproposition. This may happen after the interpretation of the first sentence or the first two sentences. Thus, after the interpretation of the first sentence of (4), p. 211, the reader may assume that this fragment will be about a boy/ man and a girl; the action is 'to see'; the boy/ man is Agent; and the girl is Patient. In other words, a number of provisional macropropositions may be made. At the same time however the reader must try to organize these in an appropriate way and start to construct a first MACROFACT: What is the global action or event going on here, and who is involved? The advantage of this strategy is that although the global action or event is not yet known, the participants involved may already receive their provisional place in the FACT schema. The second sentence in (4) then provides the global information for the modifier of the FACT schema: The girl is beautiful. This means that a macrorule (viz., a GENERALIZATION) is applied. Indeed, besides inferences about the possible participants of a MACROFACT, language users apply operations discussed in Chapter 2. Note however that there is an important difference between the 'structural' application of the macrorules and the cognitive macrooperations. A rule like GENERALIZATION would apply, in principle, only on the basis of a sequence of propositions. In our case, however, the rule is already applied on the basis of a single sentence, expressing two propositions. The same could happen just on one proposition, such as *slim(a)*. Further propositions denoting features of beauty are then captured by the same macroproposition and at the same time confirm the hypothesis.

The hypothetical application of CONSTRUCTION is similar. A discourse beginning with sentences like:

(5) John went to the station.
(6) John went to a restaurant.
(7) John went to the university library.
(8) John went to the airport.

will, on the basis of conventional frame or script knowledge be assigned a first global topic that is the instantiation of the overall concept of scripts like

'taking a train,' 'eating in a restaurant,' 'borrowing a book from the library,' and 'taking a plane.' Of course, the assignment of a macroproposition is provisional: Further information may show that the first sentence did not instantiate the conventional script but another sequence of events. For this rule to operate in a cognitive model we must assume that directly after comprehension of the first sentence a search in LTM is made for the appropriate script and its overall concept or proposition. How these knowledge structures are searched, activated, and brought to STM for application in comprehension are problems that we return to later.

Once the overall concept of a script is actualized, in the form of a macro-proposition or MACROFACT, the language user must also have available the necessary *expectations* about the possible subsequent facts of the episode and hence about the possible propositions to be expressed in the discourse. If these indeed do occur, they confirm the hypothetical macrostructure.

The cognitive application of the DELETION rule is more complex. Whereas for GENERALIZATION the language user only has to generate the appropriate superconcept of the concept of a sentence and whereas in CONSTRUCTION the appropriate script must be found, DELETION requires that the reader makes a complex 'calculation' about the possible *relevance* of the proposition. Formally, this relevance is defined in terms of relative interpretations: A proposition is irrelevant if it is not an interpretation condition of a following proposition in the sequence. But, since for the first time a text usually is read sequentially, only guesses can be made about this relevance. This is possible only if the reader has normal world knowledge about the possible consequences of certain facts. Thus, in our example the fact that the girl is beautiful is more relevant because it is socially known that such a state of affairs influences the behaviour of males. Irrelevant, or less relevant, however, is the fact that the girl wears a white summer frock. This particular kind of information is not related, probably, to *normal condition-consequence* connections in LTM. Moreover, it may be taken as a normal, strictly local detail about the way somebody is dressed. Readers also know that in narratives such details are given to make the representation more natural or 'visual.' The truthfulness of such details need not influence their relevance in the rest of the discourse. One of the particular properties of detective novels is precisely the fact that the reader does *not* know which of these marginal details later determines the identification of the villain. Also in certain kinds of literature, such details may have all kinds of symbolic functions, whereas in *particular readings* of the same discourse (e.g., from a sociological point of view) such a detail may on the contrary be an indication of a typical social situation, system, or culture. In the latter cases, macrostructure formation however is subject to the interaction of the various factors of the actual cognitive set, comprising for instance special tasks and interests. We return to this interaction later.

On the other hand, if we comprehend a sentence comprising concepts of which we know are normal components or conditions of interesting sequences of events or actions, we assume that they should not be deleted. Compare, for instance, the following examples:

(9)   (a) The passenger went to the ticket counter.
       (b) A man with a gun went to the ticket counter.
(10)   (a) From the tree a leaf fell on the road.
       (b) A tree fell on the road.
(11)   (a) John watered the roses in the garden.
       (b) John set fire to his house.

Although the difference between relevant and irrelevant information in discourse is not always so clear-cut as in the (a) and (b) examples of (9) through (11), these sentences show that -even in isolation- language users have 'normal' expectations about the *importance* of facts. Here we also meet certain pragmatic and social aspects of communication: A discourse in general is not about purely trivial things. Hence, although the notion of importance is relative, depending on the whole text and the communicative context, a reader assumes that a detail which can at most be illustrative and which hardly gives rise to an *interesting consequence set* may be deleted. Such a consequence set contains dangerous events, difficult actions, surprising or funny states of affairs, etc., which become the topic of the fragment. In other words, given the knowledge about what is interesting to tell in a discourse and what events may condition other events -which are also interesting- a reader may make serious hypotheses about which propositions condition following propositions and which probably do not.

6.3.4.   Let us now resume on what grounds a language user, given the first sentence of a text or fragment, may strategically assign a provisional macrostructure to the discourse:

(12)   (a) knowledge of the context (speaker, social situation, etc.): defines
           topic set;
       (b) titles, subtitles, announcements, prediscourses;
       (c) previous discourses (e.g., in letter writing or conversation,
           especially after specific speech acts);
       (d) topical sentences at the beginning of the text or fragment;
       (e) inference of macroparticipant from participant structure of the
           first FACT of the text;
       (f) inference of the global *semantic domain* on the basis of the
           predicates of the first sentence;

(g) provisional application of macrorules:
  - DELETION: on the basis of knowledge about interesting facts and fact connections;
  - GENERALIZATION: superconcept abstraction on one sentence/ proposition;
  - CONSTRUCTION: actualization of script, script concept, or other conventional knowledge.

We see from these various cues in the assignment of topic or theme during reading that they are ordered by *comprehensiveness* [where (12, b) and (12, C) may change place]: The first kinds of knowledge are inferred from the general communicative context, itself embedded in a particular social situation (which also constrains the set of possible topics: In class we talk about different things than we do in the bus or in bed). Then we have previous discourses (e.g., questions) that may definitely determine the possible topics of the actual discourse and then all the accompanying information about the text itself: titles, announcements, etc. Finally, there is the information from the actual initial sentences of the text. In other words, a reader already knows much before starting the actual construction of macropropositions: We would be quite surprised if during a formal exam a student would start to appraise his bike with the obvious intention to persuade us to buy it. We also see that macrorules in actual comprehension processes do not need to follow the strict semantic constraints formulated in Chapter 2. As soon as information can be taken to be irrelevant, we apply DELETION; as soon as it seems fit for GENERALIZATION, we apply that rule; and in the other cases we assume that it is part of a sequence that may be constructed by a conventional concept associated with a frame or script.

Note that the macrostructure assumptions made by the reader until now only pertain to just the first sentence of a discourse. It is obvious that the same principles apply *a fortiori* as soon as *subsequent sentences* are comprehended: Applied macrorules confirm (or disconfirm and hence change) assumed macropropositions; further participant mentioning may confirm the global role of one participant; the semantic domain is further restricted; and crucial events of frames or scripts may be mentioned. As soon as sufficient sentences are available, the macroproposition may be definitely confirmed: The text or fragment is about this or that.

6.3.5.   The various assumptions about cues and strategies of global interpretation in discourse comprehension should now be related to the *memory* structures postulated previously. The STM buffer, before reading the first sentence, *need not be empty*. When we have actual expectations about what we shall read, a global proposition may already be stored in the

buffer, drawn from episodic information about the context or from general knowledge about such contexts, social frames, etc. As soon as information from titles and other topical elements is available, the STM buffer will probably contain at least one macroproposition or a MACROFACT. The first sentence then may confirm this topic assumption or create another, more specific, macroproposition.

The model assumes, then, that nearly permanently STM has direct access to one (perhaps two or three) macroproposition(s). We have seen earlier how this information is used in the comprehension of sentences and sentence connections. At first, the macroproposition may still be very global, partial, or vague, but after the first few sentences a first low-level topic may already be formed. In principle we assume that the cyclical operation of comprehension, due to the limited capacity of the STM buffer, requires that a macroproposition must be available in the buffer before information is stored in EM. As soon as the reader believes what the fragment is about, he may safely send details to EM, because they are probably no longer necessary for the establishment of local coherence. It is the macroproposition that now cares for this relative interpretation basis. At the same time, as we see shortly, the macroproposition assigns additional structure to the first FACT of the representation of the discourse in EM and makes this FACT better available for eventual reinstatement or (later) reproduction retrievals.

Together with two or three FACTS (viz., those underlying directly connected sentences) the STM buffer now contains three to six semantic units, once added one or even two or three macropropositions or MACROFACTS;[8] that is, we leave open the possibility that the reader constructs not only the actual topic of the passage he is reading but also the more general topic of the chapter, section, or whole text. Also included is a possible presupposition of a previous sentence which is assumed to be sequentially important but which need not be part of the macrostructure.

It should be noted that the STM buffer is probably not a *list*. We have observed earlier that sequences of propositions, which are already conditionally connected, are organized in FACTS during local comprehension. Then we saw that FACTS themselves are in many ways connected and

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[8]The estimated values for the number of semantic units (propositions or FACTS) in the buffer of working memory are of course purely theoretical; that is, the model specifies only which units must at least be available for immediate semantic processing of sentences in discourse. As stated in footnote 5, p. 2 10, these values are also more or less empirically warranted. We say 'more or less' because much depends on the nature of the units, the degree of their organization, and a set of personally varying factors for storage capacity. Our model, and especially the hypothesis about the FACT-structure of propositional text bases, not only is formally motivated but also follows well-known facts of cognitive processing, such as STM-buffer capacity (see Milier, 1956). It should be added that the number of approximately seven semantic 'chunks' (e.g., propositions and/ or FACTS) are again organized (viz., by connections and relation with MACROFACTS).

have other coherence relations. The added macropropositions and their organization in MACROFACTS further assign structure to the context of the buffer (see Fig. 6.1). The structure represented in Fig. 6.1 would be the tentative content of the STM buffer after reading, for instance, three sentences of the beginning of a text. The MACROFACT may already have been established after reading of the first sentence (viz., by inference from the first FACT). This example structure would fit our example text (4), being rewritten from the earlier crime story. The MACROFACT in that case could be 'Ken is impressed by a pretty girl.' Note that besides the hierarchical relations [viz., those building FACTS from propositions and macrorules deriving (MACRO)FACTS from FACT-sequences] we have indicated conditional and other coherence relations in the graph. For instance, the FACT that the girl is slim is a possible condition for the FACT that Ken finds her pretty. Similarly, in each of the FACTS we find the atomic proposition argument denoting the girl. Of course, the graph is merely an illustrative example. The idea is only that information in the buffer must be stored in an *organized* way, given the strict capacity limitations of STM and given the necessity of fast availability of the information in local processing. If the information would not be readily available, the advantage of storing the information in the STM buffer instead of bringing it right away to EM would be lost.

Although other theoretical models are possible, we would like to stress here that the very nature of complex information processing in discourse comprehension forces certain constraints upon the model, for example, the presence of coherence relations and hence of the bearers (e.g., propositions of FACTS) of these relations and the fast availability of these units. The immediate interpretation of connectives, pronouns, sentential adverbs, incomplete sentences, topic-comment constructions, definite articles, etc., would not be possible for instance if the model would store all the information directly in EM. In this respect the processing of sentence pairs of triples is close to that of complex sentences with several clauses. Experiments should be set up to test the various implications of the theoretical assumptions of the Model: What is the distance between propositions and FACTS that usually still

require immediate connections? How easy and /or fast can language users do that? What is the cue value of the sentence boundary? What is the capacity of the buffer as soon as the respective sentences are not or are hardly coherent? The last is sometimes locally possible when different aspects of the same scene are described: *It was a beautiful day. The water of the sea was very calm. Tourists were crowding on the terraces....* In general it might be predicted however that elements of the buffer are available better and faster than the information stored in EM.

Although the STM buffer could probably store around seven semantic units, this maximum capacity need not be fully occupied. More often than not, it may be assumed, the reader will try to keep the load as low as possible, not only to facilitate search in the buffer itself during local comprehension but especially to have a necessary 'reserve' as soon as more complex information comes in and requires comprehension. So the load also depends on the nature of the information being processed: It is experimentally well-established that long and complex sentences (depending on topic and cognitive set variations among subjects) take more time and are less easy during reading than short and simple ones -if these are well-connected and coherent, of course.[9] For complex information the load of the STM buffer will probably often be at its maximum, a situation that might have very specific physiological consequences after a time (headache, tiredness, etc., after reading complex discourses). In simplier discourse perhaps only three or four elements are necessary in the buffer to process local coherence. We may assume that there is a strategy that allows a reader to send information directly to EM if it is assumed to be irrelevant probably for the comprehension of the next sentence. This may happen for instance with the last sentences of a section.

6.3.6.   In our discussion about global comprehension we now have some hypotheses about the various cues language users may have available for the construction of macrostructures, and we have some hypotheses about the storage of macrostructures and their relations with microstructures in the STM buffer. However, we have little insight about the actual *operations* going on in STM in the global comprehension of discourse. It has been proposed that macropropositions are tactically inferred, as soon as possible, from the initial FACTS expressed by the text. This operation is one of *inductive inference*: Conclusions are drawn on the basis of incomplete information. For most of the operations the information in STM itself is not sufficient: Various kinds of knowledge of the world must be actualized from LTM, and it is possible that information from the cognitive set also interacts in the operations. If for instance we have specific tasks or interest focus,

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[9]See Kintsch (1974) for relevant experiments.

information form the text may already be marked or selected in the STM operations.

Analogous to similar assumptions at the levels of surface analysis and the comprehension of clauses and sentences, it has been assumed that macrostructures often are already formed *before* a sequence of sentences is comprehended (e.g., after the first clause whether the formation of macrostructure or sentence). The question now is in this way is *linear* or *parallel*: Do we first compute the meaning of a sentence, then of the corresponding assumed macrostructure, and then go to the next sentence; or do we form macrostructures *at the same time* as we interpret the local structures and connections? In case of the linear hypothesis it would theoretically be the case that the transition from one sentence to the next would be slower, because intermediary time for the formation of macrostructures would be consumed, unless the macrostructure is already available in the buffer. When the topic *changes,* as at the end of a paragraph or section, a new additional higher-level operation would be necessary. The parallel hypothesis would predict no specific differences in reading /comprehension times between sentences where a new topic is started. Although complex information processing may well have a number of parallel analytic processes, which mutually interact, such as morphophonological, syntactic, and semantic analysis, we provisionally assume that semantic *operations* take place linearly but that the representations (e.g., in the STM buffer or in EM) are hierarchical. We do not have particular experimental evidence for that assumption but only the theoretical hypothesis that no two operations *of the same kind* take place at the same time.

Whether it is possible to isolate the process of macrostructure formation in experimental design is a problem that cannot be solved here. Since we have assumed that as soon as a sentence has been understood, the reader will make appropriate hypotheses about the theme of the particular text segment, there does not seem a straightforward manner to prevent this inference at the right moment. However, as soon as we provide following sentences that clearly cannot be subsumed under a possible topic thus constructed, the reader may well reject an earlier hypothesis and follow the 'wait-and-see' strategy: Are the following sentences providing information that retroactively provide a possible topic for the last sentences? The originally not globally coherent sentences would have been stored in EM in the meantime however and must be reinstated for this process of a posteriori interpretation.

In case macrostructure formation is parallel, we might try to see whether blocking of higher-level understanding would be possible during further local interpretation. We cannot imagine at the moment an interfering task, however, that would only be executed at the higher level so that lower-level processing goes on unimpaired.

6.4. COMPREHENSION OF SUPERSTRUCTURES

6.4.1.   Little is known about the processes in which language users 'comprehend' superstructures of discourse.[10] Yet, this kind of comprehension takes place, and from rather early in childhood individuals intuitively know when a story is a story or not, whether the story is finished, and so on.[11] For more institutional superstructural schemata, this knowledge may be less implicit: We may recognize an argument without appropriate premises or without conclusion and would recognize the psychological experiment report without mention of results, conclusions, or discussion sections. The problems involved here are not simple: The construction of superstructural schemata at the basis of discourse belong to higher-order complex behaviour. On the other hand, their conventional nature seems to imply that they are readily available in LTM. The question then is what *cues* in the discourse activate the various categories, rules, or schemata from conventional knowledge: How do we know what the Complication of a story is, and how do we know that an argumentation is finished?

6.4.2.   Superstructures have been taken as conventional organizational schemata for macrostructures: They organize the global content of discourse. Their categories are often developed from *functional* relations between (macro-)propositions. These functional relationships, at the level of microstructure, contribute to the further coherence of the discourse. We assume therefore that language users have categories available during semantic analysis that allow them to establish these relationships between FACTS: thus *FACT 2* may be taken as a specification or explanation of *FACT1*. We hereby acquire an additional linear link between subsequent FACTS in the STM buffer. Such functional relationships are not unimportant during comprehension. They allow the reader for instance to decide which information is relevant (e.g., at the macrostructural level): A FACT which is merely a further specification may in that case be less important than a FACT which is functioning as an explanation or a conclusion of another FACT.

6.4.3.   The comprehension of conventional superstructures seems to take place in a different way, however. The superstructures are not simply inferred from individual sentences but either require operations on sets of

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[10]See, however, the experimental results about superstructural schemata in Mandler and Johnson (1977), Mandler (1978), Meyer (1975), van Dijk and Kintsch (1977), Kintsch and van Dijk (1978), Kintsch (1976, 1977a), Thorndyke (1975, 1977a), Rumelhart (1977), Bower (1976), and Kintsch, Mandel, and Kozminsky (1977). See also van Dijk (1980a) and de Beaugrande (1979). Thorndyke (1977b), however, finds less evidence for the role of this kind of schemata.
[11]See Mandler (1978).

macropropositions or must be directly available from context (hence from EM) or from general knowledge.

In many communicative contexts it is the case that the hearer or reader knows or has plausible expectations about the *type* of discourse, as well as about the nature of the pragmatic and communicative context as a whole. This means that he also may have previous assumptions about the schematic structure of the text. In a daily conversation the participants know the possible structures of the conversation; in the classroom and in court only certain kinds of discourse are possible; and the same holds in reading textbooks or scientific journals or newspapers. Besides this contextual knowledge, the type of text may be signalled by subtitles or announced in other explicit ways: *did you hear the story about... ? I shall show you that....* The relevant global schema may in such cases be drawn from memory and applied during the global interpretation of the discourse in a typical *top-down* way of processing.

In linear discourse comprehension this means that by hypothesis the first category of a canonical superstructure, like the 'normal form' of a story, is matched with the initial macrostructures derived from the first sentences. If these are a state description, they may provisionally be taken as the Setting of the story. This means that in the STM buffer the MACROFACT is assigned provisionally to this category, until further evidence from the discourse contradicts this hypothesis. Instead of further 'content' the buffer hereby receives further structure, although it may be possible that the node labels, like 'Narrative' and 'Setting,' organizing the macrostructure in the buffer may take up conceptual space equivalent to one semantic unit. This additional load still keeps the total load of the buffer within the limits of the theoretical capacity previously assumed.

6.4.4. Besides the contextual information leading to assumptions about the actual schema, the discourse usually provides a number of *verbal cues* for the correct construction of the schema. This is necessary because it is not always the case that the discourse expresses a canonical schema: Transformations of various kinds are possible. Also the reader must be able to know when to actualize or to construct the next category of a schema. The most obvious cues are explicit *category markers* in the text: *Introduction, Conclusions, Moral*, etc., as they occur in scholarly discourse. Second, there are a number of surface cues, certain words, which often announce both a change of topic and a change of schema category. Thus, the Complication in a story may be marked with expressions like *Suddenly, Unexpectedly*, etc. The Conclusion is marked with *So, Thus, Consequently*.

The most crucial cues, however, come from the semantic information of the text itself. Categories of different schemata are associated with specific semantic constraints, so that events that are known to have serious

consequences in a story may be interpreted as the Complication and the reactions of an agent as the Resolution, whereas general conclusions and reference to future action may be taken as the Moral.

The structural inferences involved in the global comprehension of discourse are not always so straightforward as we seem to suggest here. First, it is stressed in Chapter 3 that it may well be the case that not all discourse types have a conventional superstructure. In that case the functional relations between MACROFACTS may take over the global organization of the macrostructure. Second, especially in rather long and highly complex discourses, such as novels, textbooks, or scholarly papers, the schema may be deficient, not explicitly marked, or so complex that it cannot be easily constructed. Specific resources during comprehension, such as repetition, rereading, making notes, and schematic drawings, may be necessary in the construction of the schema.[12] In that case, the construction process often is no longer automatic, as in short stories, but a conscious and even planned action.

6.4.5.   It should briefly be recalled here that the schematic interpretation of discourse at the local level, by the assignment of categories to macropropositions, does not mean that the overall schematic organization of the discourse in EM copies the original structure constructed in STM. We return to the representation of the discourse in EM shortly, but it should be, stressed here that this original structure need not be the canonical structure in EM that we may later form by retransforming the original schema structure.[13]

Related to this assumption is the hypothesis that superstructures should not be studied only in terms of *fixed* schemata. Although the use of canonical schemata is an expedient strategy in discourse organization, actual discourse often has a different schematic structure, which can be understood only by language users when they dispose of superstructure *rules*. These rules specify what the *possible* orderings (and transformations) of superstructural categories are. Thus, a story may be understood and accepted as a narrative due to these rules, even if the schema in the text is not canonical. We have something similar in the interpretation of sentences: Although we have a set of normal or preferred sentence 'schemata' in each language, rules must eventually be applied to establish the actual structure of the sentences. Canonical schema structures are however important in a cognitive model because they allow fast structural interpretation of sometimes highly complex information structures.

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[12]See Breuker (1979).

[13]See Mandler (1978), who also shows that children especially will reproduce noncanonical schemata as canonical ones, whereas adults are able to memorize 'deviant' schemata better. Note though that these experiments use mingled stories, that is, mixed macrostructures rather than transformed schemata, although the latter are of course also involved   indirectly.

At the moment there is very little experimental evidence about the actual functioning of superstructure schemata during comprehension. The analysis of recall or summary protocols shows that a schema is present, but its conventional nature makes it possible that the schema is simply constructed and not simply reproduced during a recall protocol production. Only under specific task conditions are specific original schemata as such reproduced.

6.5. THE REPRESENTATION OF DISCOURSE IN MEMORY

6.5.1.   The next important component of a model of discourse comprehension should specify how semantic information constructed in STM is stored in memory. In other words, how is the discourse *represented?* In the previous sections we have merely looked at the interpretation process in STM and the initial organization of discourse fragments in the STM buffer.

We have seen that the cyclical nature of discourse comprehension makes it necessary that regularly semantic information is transported to a longer-range memory store. We have assumed that this store is *Episodic memory*. The *contextual* nature of the representation is especially relevant here: The information acquired from the text is marked with all kinds of contextual information like who said it, when and where, and what the further pragmatic and social context of the utterance was.

Although certainly fragments of surface structure information may also be stored in EM (e.g., style, a particular expression, intonation, place on the page, or letter type), we assume that EM is predominantly *semantic*.[14] If surface structure is stored, it is most often stored such that it cannot be retrieved, at least after some time.

According to our assumptions in Section 6.4, we must assume that what reaches EM is an *organized* sequence of FACTS. Indeed, we make the additional strong hypothesis that the representation of discourse in memory is a direct function of the structures assigned to it in STM. If reorganization is necessary, this must also happen in STM. The organization assigned to the semantic information in STM, and as it is represented in EM, involves the following features at the moment:

   (a) FACT-structure of propositions;
   (b) conditional relations between FACTS;

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[14]This assumption especially holds under 'normal' discourse-processing contexts. Of course, under specific tasks it is possible also to store more superficial (e.g., syntactic) information in long-term memory (see Keenan, 1975b). In general though language users after some time are no longer able to remember by which syntactic structure some information was conveyed to them (see Bransford & Franks, 1971), although *recognition* of style is much better.

(c) other coherence relations between FACTS;
(d) functional relations between FACTS;
(e) hierarchical organization of FACTS under MACROFACTS;
(f) superstructural organization of MACROFACTS in schemata.

This means that the discourse is highly organized, at several levels, in EM. This storage is gradual: The respective semantic units are entering EM and stepwise are linked in an overall representation. The necessary structural links in that case have been specified already in STM, so that each element is added, at each level, to a preexisting structure slot.

6.5.2.   It often happens that part of the text representation in EM is needed in STM to interpret a certain sentence or sentence connection, especially since the buffer of STM is so limited. Events must be recalled and certain consequences are now mentioned; participants must be reinstated that now reappear in new FACTS; etc. Moreover, that is the point of interest for our discussion: Sequences of macropropositions need further global interpretation by assignment of higher-level macrostructures. We ignore under what conditions this process takes place. How do STM processors know that the information in EM needs further organization? Since we have no specific ideas about storage capacity in E M, it would be difficult to assume that the rise of complexity above a certain threshold in EM requires further application of macrooperations in STM upon macrostructures reinstated from EM.

6.5.3.   There is another problem about the storage of semantic information in memory. The comprehension model has tacitly assumed that during reading *all* propositions and FACTS expressed by the discourse are actually comprehended and stored in the STM buffer. Of course, this assumption is not plausible. Due to lack of attention, interference with other information, skipping, etc., it may be the case that, at least locally, a number of words, phrases, or sentences are not read at all or not translated into conceptual structure. This implies that storage in EM will not take place, if the general condition is processing in STM. Although the same might happen during the transfer operation from STM to EM, we provisionally assume that all information processed in STM by the assignment of conceptual structures is also part of the representation of the text in EM. This does not mean at all that the information also can be retrieved in processes of recall or recognition. On the contrary, most of the propositions we have once read no longer can be retrievable. Since however in principle any detail of the text may be relevant for further interpretation somewhat later, we assume that, at least by recognition, the reader is able to retrieve this detail from EM.

6.5.4.   The full cognitive importance of macrostructures becomes apparent in the representation of discourse in EM. Whereas in STM they merely function as tentative global coherence links between FACTS, their organizational power in EM is demonstrated by the assumption that long sequences of FACTS of the microlevel may be subsumed under MACROFACTS and that in turn MACROFACT sequences may be dominated by higher-level MACROFACTS. The representation of the discourse in EM thereby acquires a hierarchical structure, depending on the global interpretation operations of STM.

   This kind of organization of discourse information implies that each proposition and even each concept in the representation may have a different *structural value*.[15]

6.5.5.   As expected, the representation of discourse in memory is organized not only by its macrostructure but also by its *superstructure*, if any. Besides the possible functional relations between MACROFACTS, these may also be assigned to the slots of a superstructure schema. In principle, this is the schema as it has been constructed in STM. However, it may also be the case that the schema is drawn directly from our general knowledge about such schemata. In that case, the respective MACROFACTS may be organized according to a prefabricated, canonical structure. This assumption is necessary to explain the fact that language users tend to reorganize input information according to preestablished memory structures.[16]

6.5.6.   The picture we have just sketched about the global organization of semantic and schematic information in memory representations of discourse is rather straightforward but also simplistic. It assumes that discourse processing takes place *in vacuo*, without all kinds of other information interfering or connecting with textual information. Discourse, however, is

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[15]The notion of 'structural value' is merely tentative for the moment. Such values may be calculated on the basis of the number and 'weight' (importance) of structural relationships in the representation. MACROFACTS per definition are related to several lower-level FACTS and hence have higher structural value than these lower FACTS (if the values are summed up hierarchically). Similarly, lower-level FACTS have higher structural value if connected with several other FACTS Of the same level or with other memory information.

[16]We see that discourse processing involves both *bottom-up* (macrostructure and superstructure formation) and *top-down* (inference from knowledge and local comprehension determined by it) processes. Both strategies occur depending on the completeness and availability of necessary information. Thus, we may assume that since superstructures are per definition conventional, processing them is often top-down. In macrostructure processing we often have a mixed strategy: First a topic is formed bottom-up (e.g., in story comprehension) after which the topic searches for relevant microinformation (top-down) in order to be 'confirmed.'

comprehended first as part of a sequence of speech acts in a pragmatic context, a point that we return to later. The same holds for the further aspects of the communicative and social contexts. This knowledge is also represented in EM, and it is plausible that it will interact with the representation of the text. Thus, the macrostructures which have a pragmatic function receive further structural organization and so does any information from the text which has specific links with conditions, conventions, participants, or frames of the context as it is represented in EM.

Similarly, there is a complex set of personal factors (e.g., beliefs, task /purpose, interest, or attitudes) together forming what we call the *cognitive set* of a language user, which interferes with the representation of the text in memory. In part this already affects initial comprehension; in part these structures are represented in EM and link up with the various semantic units of the text. This may mean, for instance, that a particular element is found more relevant, important, or functional in this context, which enhances its structural value. We now discuss this problem.

6.6. THE ROLE OF KNOWLEDGE IN DISCOURSE COMPREHENSION: SCHEMATA, FRAMES, SCRIPTS, ETC.

6.6.1.   Throughout this book several times it is emphasized that the interpretation of discourse and interaction requires an important *knowledge* component. Without such knowledge of the world in general and about the actual context of speech and interaction in particular, communication would be impossible. We have seen more in particular that sentences in discourse are connected not only on the basis of their 'own' semantic structures but also due to sometimes several implicit steps of inference on the basis of our knowledge about what situations, scenes, and episodes usually look like. Similarly, the application of macrorules appear to be possible only if we know what kind of properties and events are more or less relevant, compared to others, and what normal conditions, components, and consequences defined the global concept of social episodes. This is not only true for the interpretation of discourse but also holds for (inter-)action: The pairing of observed doings with various possible, often higher-order actions is possible only due to our conventional knowledge. Finally, the first fragment of the cognitive model just sketched constantly has to make reference to the knowledge items required to perform the complex operations of comprehension. In this section then we rather briefly discuss this role of knowledge in discourse comprehension. Our remarks, *mutatis mutandis*, also hold for the interpretation of (inter)action.

6.6.2. Our discussion about the important role of knowledge in discourse comprehension must necessary be relatively succinct: A full discussion would

require at least a complete monograph. On the other hand, we may keep the discussion short also because there has been much attention in recent cognitive science, especially in artificial intelligence, for the problem of knowledge representation.[17] In those discussions also the role of knowledge in discourse understanding has been analyzed.

Although there has been much recent work in this area and although it has been undoubtedly shown that without knowledge of the world we cannot understand complex information such as discourse, we have as yet hardly any insight into the actual *processes* involved in the formation, change, and use of knowledge in communication interaction. This means that we should study the ways on the one hand in which knowledge is acquired more closely in processes of *learning* and on the other hand how this knowledge is manipulated as soon as all kinds of cognitive tasks, like reading and comprehension, require it. In other words, how knowledge is *used* is still much of an open problem.

Recent work has emphasized the various aspects involved in the *representation* of knowledge in memory. It is understood that this knowledge is part of *semantic* or *conceptual* (long-term) *memory*. This knowledge has a general nature. Particular knowledge about the actual context and about everything a person can remember is better stored as episodic information. Clearly, general knowledge is derived from episodic knowledge by a number of different *operations*, such as simple addition (e.g., of concrete facts), generalization, inductive and deductive inference, (re-)construction, and the formation of various kinds of knowledge schemata.

One of the most important conclusions from recent work on knowledge representation has undoubtedly been the nearly obvious but yet very important assumption that knowledge is *organized*. In earlier work in the field of semantic memory this assumption was especially focused on all kinds of semantic relations between concepts. In recent years more *complex conceptual structures* have been discussed, especially those necessary to account for such everyday tasks as (inter-) action and verbal communication. Many concepts have been introduced for such complex conceptual structures (e.g., *schemata, frames, scripts, scenarios, and demons*)[18]. Although here

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[17]An early work in this field is by Carroll and Freedle (1972) in which attention is paid to discourse. in artificial intelligence the dissertation of Charniak (1972) first spelled out in detail which knowledge is involved in comprehending children's stories. Current work has been reported in Norman and Rumelhart (1975) and Bobrow and Collins (1975).

[18]See the references in footnote 17, above, and see Schank and Abelson (1977), who use the notion of 'script' ; Norman and Rumelhart (1975) and their associates, who use the term'schema'; and Charniak (1972), where the term 'demon' was used -in a somewhat different sense. These notions are further developments of the notion of 'frame' introduced by Minsky (1975). For the role of frames /scripts in the formation of macrostructures, see also van Dijk (1977a, e).

It may be added here that the historical background of many of these notions constitutes the work of Bartlett (1932), whose notion of 'schema' shares some of the features that current concepts also have.

we cannot discuss the various proposals, each with its own advantages and disadvantages, we briefly define the various notions that we think are necessary in a theory of (cognitive) knowledge that is a component in a more general theory of complex information processing.

6.6.3.   Some further methodological remarks are necessary. We take a theory of knowledge and knowledge representations here as part of a *cognitive* theory. This is not a necessary direction of research. In the same way as we may treat language and action in abstraction from the actual cognitive processes and memory stores, knowledge may be analyzed in a more abstract way.

First, this kind of systematic and abstract properties of knowledge have been the object of *epistemic logic* and related areas in philosophical logic and philosophy.[19] Such a logic would especially try to work out a viable epistemic language, set up a number of rather firm general principles of knowledge (axioms of the system), and formulate derivation rules for the syntax and interpretation rules and a model theory for the semantics.

Expressions of such a logical language would be: *Kp* for 'it is known that *p*', or *Kx p* (or *Kap*), with a variable or constant index, for '*x* knows that *p*' and '*a* knows that *p*'. One of the well-known statements of this kind of logic for instance is the one based on the presuppositional nature of the use of the concepts of knowing (viz, *Kap D p*: If *a* knows *p,* then *p* is the case). *K* in such expressions is an operator, making propositions out of propositions. It may also be reiterated: *KaKbp, KaKbKap*. This kind of reiteration is a normal condition in the appropriateness conditions of speech acts discussed in Chapter 4.

Problems in this kind of epistemic logic have arisen about the *empirical* basis of the basic assumptions. First, the various reiterations of operators have a natural boundary, probably not surpassing a depth of three or four. Second, as soon as a normal propositional logic is embedded in the system, it must be asked whether knowledge of certain propositions also involves knowledge of all their logical implications, which is clearly not the case. The same holds for the consistency of the system: It may well be that a person 'knows' *p* and, independently, also 'knows' *-p*. In such cases, natural language use often goes over to the concept of *belief* which is *subjective knowledge*, or knowledge with lower degrees of *probability* or *certainty*, involved. In philosophy, beliefs are systematized in *doxastic logics*, in which the typical form *Bxp D p* does *not* hold. The link between the epistemic and the doxastic logics is established by the statement *Kxp D Bxp* (but not conversely, of course). Finally, it should be mentioned that it appears to be far

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[19]For epistemic logic, see the classical account by Hintikka (1962) and Phillips Griffith (1967). For doxastic logic, also see Rescher (1968) and Kummer (1975).

from easy to make adequate *semantics* for these systems, because in that case the ontological and hence also empirical problems appear in their full complexity.

This brief reference to epistemic and doxastic logics is made here to stress that besides work in cognitive science there has been considerable research on the systematic analysis of the notion of knowledge. Future formalization of a cognitive model of knowledge might profit from this work, and conversely the logic may need further insights into the empirical aspects of knowledge (instead of the plausible intuitions now used). It should however be stressed that a cognitive model is not primarily interested in the abstract format of knowledge relations but rather in the *content* of the knowledge of persons of a certain society and culture and the ways this content is acquired, organized, and used.

Closer, then, to this cognitive concern is the work in linguistics on the structure of the *lexicon*.[20] For linguistics, traditionally, the meaning of words and, by rules, also of phrases and sentences is based on the elementary and complex meanings specified in the lexicon. In such theories it was always a problem where to put the boundary, if any, between 'meaning' as knowledge of the language and 'meaning' as knowledge of the world. The latter kind of meaning, then, would not be the object of a linguistic theory. Only the 'fixed,' 'conventional' meaning of words of the language belong to the lexicon, in such a way that systematic distinctions are possible with meanings of other words of the language. Instead of all possible social associations and physical or other properties, only a limited set of generally known, crucial meaning components of each word meaning were specified in the lexicon. Although, perhaps, a division may be made in theory between knowledge of the language and knowledge of the world, such a division has never been made explicit in any lexicon or grammatical theory, and here we simply assume that at least in a cognitive theory of discourse processing such a distinction is not fruitful.

6.6.4.   Although it is not easy or even possible to distinguish explicitly between language meanings and knowledge of the world, both being represented as *conceptual structures* in memory, it makes sense to distinguish between *personal* knowledge and *social* knowledge. Social knowledge is the knowledge shared by all or most members of a social group. In this sense this knowledge may be called *conventional*.[21] In general, personal and social knowledge of course is not identical but overlaps: Each person knows many private things others don't know. In discourse comprehension, this means that, in any theory and experimental design there is always personal variation

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[20]See especially Lyons (1977, chap. 13 and passim) and Petöfi and Bredemeier (1978).
[21]"Conventional" has been used here in the sense of Lewis (1968).

in interpretation, storage (viz., 'association' with this personal knowledge), and reproduction. On the other hand, comprehension and communication is possible only due to a large amount of shared, social knowledge.

This is well-known but also has consequences for the organization of general knowledge. For the sake of argument, we may distinguish between two different kinds of organization, both of which are operative in memory, viz., *systematic* organization and *prototypical* organization.[22] Systematic organization is based on semantic relations and elementary semantic properties: It allows us to recognize and call a dog an animal and a house a building and in general to classify and compare things. Prototypical organization is also about the 'structure' of the world but in a different sense: It says something about how things, especially complex social things, *normally, usually, typically*, etc., are. In systematic knowledge we know something very general about the relations between chairs and tables, dogs and cats and calling and crying. Prototypical knowledge, however, tells us how a chair, now and in our culture, would *normally* look and which chairs, therefore, are funny, surprising, or weird. The same holds for houses, people's faces, rooms, and dresses. Still more interesting, however, is the function of prototypical knowledge for higher-order structures of the world: *scenes, situations, interactions, courses of events and actions, episodes,* etc.

The normality involved in prototypical knowledge may be based on different sets of *postulates*. Thus, physical postulates represent our knowledge that seeing lightning usually is followed by hearing thunder, that things heavier than air fall, that butter melts in the heat, etc.; idem for our naive biological knowledge and again for psychological and social knowledge: People may become angry when we offend them; they are sad when they loose friends; they greet each other in certain situations and argue in others, etc. In other words, knowledge of this kind pertains to what we think is *possible, likely,* or *necessary* in possible worlds or situations of the actual world or worlds similar to it.

Notions such as *schema, frame*, or *script* have been developed to capture this prototypical knowledge we have about the world. In particular they pertain to *complex, higher-order* structures of reality involving psychological and social postulates. Understanding interaction and discourse specifically involves this kind of knowledge.

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[22]Of course these are not the only kinds of knowledge. The distinction is relevant especially for general knowledge of language users as social participants and is not meant to apply here to episodic knowledge. The distinction has some similarity with the 'synthetic' versus 'analytic' distinction in the philosophy of language. However, although some kinds of general knowledge we have is of analytic nature, most general knowledge about the world is synthetic or 'factual' (i.e., depends on the particular structures of possible worlds). Prototypical knowledge also is of the synthetic kind but has many additional properties.

Although the notions just mentioned have been used in different ways, often overlapping each other, and although further distinctions may be made or different definitions may be given, we provisionally distinguish some notions that are relevant in discourse processing:[23]

1. *Schemata.* The notion of schema is perhaps the most general in the prototypical organization of knowledge. It involves the fact that properties and events are organized (e.g., linearly and/ or hierarchically). Earlier we used the more particular notion of superstructural schema, denoting the overall categorical structure of discourse, such as narrative or argumentative schemata. In this perspective we use the notion, in a more general way, to denote the overall *structural* organization of complex conceptual units, such as situations and episodes. This structure is defined in terms of *categories* and *rules* or conventions of linear and hierarchical *ordering*. At a more basic level, schemata may have their origin in perceptual organization, along such categories as 'horizontal,' 'vertical,' 'surface,''bottom,' and 'top.' For social situations and events, the categories may pertain to 'beginning,' 'end,' 'importance,' 'level,' etc., as we see in particular for the organization of interaction and conversation.

2. *Frames.* More recently, the notion of frame also seems to have a rather general application in the organization of knowledge, pertaining both to the prototypical forms and 'contents' of rooms, streets, or libraries as well as to those of birthday parties, lectures, or bus rides.

Our use of the term, however, is more restricted here. First, we reserve the notion for *complex* conceptual structures only. Hence, prototypical knowledge about books, chairs, buildings, animals, anger, pain, eating, etc., is organized in *concepts*, which of course may be linked to other concepts. Frames, thus, are involved only as soon as we have prototypical *combinations* of concepts. In principle, this may involve objects, persons, and also events or actions. In particular, we use the term to denote prototypical *situations, backgrounds, environments,* or *contexts* in which events and actions may take place. In this sense, the notion of frame is *relative*: It denotes a *framework* for something else. A frame, thus, may be defined in terms of spatiotemporal properties, a prototypical collection of objects and persons and their prototypical properties and relations. A room, a library, a restaurant, the street, the beach, a bus, and a university are such frames: Social events and actions are defined with respect to the objects and persons

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[23]Our brief characterization given in this section for the various types of knowledge organization is intended not only as a summary of uses of these notions in the psychological and AI-literature but also to make further distinctions or to make our own use of the notions more explicit. Thus, we have proposed to make a difference between a script and the frame for such a script, among other distinctions.

that typically are present in these frames. Characteristically, frames are culturally variable: A prototypical room is furnished differently in Amsterdam than in some village in Africa. The frame specifies what members of a given culture may *expect* to find in particular situations: what objects should be present, what may be present, which properties they have, what the relations between them are, how they are categorized, etc. Frames may be organized hierarchically: They may be parts of other, higher-order frames: rooms being frames of houses, being part of streets and towns, etc. Similarly, buses are frames of higher-order transport frames. Various examples of *social frames* are discussed in Chapter 4.

Frames organize conceptual knowledge. However, besides the prototypical information stored in frames, we may have more general, abstracted *concepts* to denote or process situation-like structures: We have the concepts of 'room,' 'restaurant,' and 'street,' which merely contain general and crucial features of objects or places (e.g., the fact that a room is specific part of a house). Concepts may be taken as the *upper-level label* of their corresponding frames. They contain the minimal differences with respect to other concepts (and frames). Although this distinction is not yet explicit, it must do for the moment. Our main reason for using a more restricted use of the notion of 'frame' is that it would become virtually meaningless or too general if it would apply to conceptual organization *tout court*.

3. *Scripts.* The notion of 'script' has more 'dynamic' features. It is used here to denote prototypical *episodes*, that is, sequences of events and actions, taking place in frames. Scripts are typically based on different kinds of *conventions*: habits, rules, laws, etc., which say which actions should or could be accomplished where and when and in which order. By definition, conventions pertain to social scripts that denote the social episodes we earlier called routines. We mostly think of such social episodes when we use the term 'script,' although persons may have 'personal scripts,' which organize their habitual actions. Thus, what we usually do when we take a bus, eat in a restaurant, give a lecture, participate in a demonstration, or go to a party is organized by scriptal knowledge. Note that prototypical organization of events and (inter-)action should be distinguished from the organization of *natural* action sequences (e.g., when eating, we put something in our mouth and then swallow). The boundaries between natural and prototypical action sequences are however fluent: Fighting with each other, for instance, involves both natural and 'cultural' and hence prototypical properties.

We should also distinguish between *scripts* and *plans*: A script is part of our general, prototypical knowledge of the world; a plan, however, although also pertaining to action, is a particular, complex intention of an agent or group of agents to reach a particular goal in a particular situation. We return to this notion later.

6.6.5.   After this first delimitation of a number of key concepts in the organization of knowledge, further remarks are necessary about the *internal makeup* of frames and scripts. Since they organize complex conceptual structures, we should expect that they themselves are also organized: A frame or script, therefore, is not simply a *list* of propositions. Although the internal structure of frames and scripts is very important in their *use* (e.g., in processes of discourse and action comprehension), we know as yet very little about their internal structure, and our remarks here therefore can only be provisional and speculative.

First, we assume that conventional scripts are *embedded in frames*; that is, the subsequent interactions are, among other things, defined in terms of objects, persons, properties, and relations of a frame. That we take a basket in a supermarket, for instance, is a prototypical action with respect to a prototypical object of a supermarket frame and, similarly, for sitting on a seat in the train, calling a waitress in a restaurant, or passing a security check in plane travels. Conversely, that we do not choose a hammock when flying a plane is not only because it is not in the script but rather because hammocks do not belong to the usual outfit of plane frames.

The embeddedness of scripts in frames may imply that the *schematic* structure of frames also imposes schematic structure on scriptal interaction. Since many enclosed places, such as buses, rooms, or restaurants, have *entrances /exits*, prototypical actions in such frames may *start /end* with respect to such categorical properties of frames, (e.g., *entering* and *leaving*).

Second, the organization of scriptal interaction may be formulated in terms of sequential and global *results* and *goals*: Participants go through a number of interactions to realize prototypical purposes and plans (e.g., to buy and have groceries in a supermarket or to order and eat something in a restaurant). The latter examples involve sequential results and goals (viz., specific final states that are to be realized). Going to a party, however, has global results and goals like enjoying oneself and meeting people. In the first case, actions are performed *in order to* be able to perform other actions, along the possible, probable, or necessary modes of conditioning: Buying a ticket may be a necessary condition for a bus ride, and paying may be a necessary condition or consequence in a restaurant, whereas sitting in a train is a probable but not necessary component for travelling by train. Hence, the interaction sequence organized by a script has prototypical conditions, components, and consequences and also prototypical and *free* auxiliary actions: Calling a waitress, for instance, is a prototypical auxiliary action that has as its function the prototypical component action of ordering food. Making a conversation with her, then, is a free component action or a free auxiliary action to obtain the food more quickly, for instance.

Finally, scripts are organized hierarchically by *macrostructures,*[24] as may be expected of complex interaction sequences in general; that is, sequences of (inter-) actions may be mapped onto more global (inter-)actions, and so on until the most general prototypical (inter-)action is reached, according to the macrorules defined earlier. Thus, ordering food in a restaurant is constructed from the action of calling a waitress and a number of speech acts (about the menu, etc.), eating by a number of preparatory and component actions, and paying at the end. The highest-order action would in that case be 'eat' and the highest-order frame concept, 'restaurant'. Whereas the lower-order actions may be natural routines, the higher-order actions may be conventional, both in their nature and in their ordering: Leaving money on the table is not 'forgetting one's money' but 'giving a tip,' and paying after eating is a convention since in other situations, like in taking a bus, paying would be done in the beginning. In the latter example we see again that macrostructures of scripts are organized by schemata (viz., those involving categories like 'beginning' and 'end'). Whereas schemata indicate the global *structure* of a script, the macrostructures define its global *content* and the various levels of planning and interpretation.

Macrostructures of scripts are important in the *cognitive use* of scripts: They enable somebody to actualize a script 'at' variable levels, depending on the specific task or function for which the knowledge is necessary.

6.6.6.   Schemata, frames, and scripts should not be defined in terms of static structures or fixed courses of action. First, their strategic application requires a highly flexible organization, especially at the lower levels. Since they organize general, prototypical knowledge, they first need *variable* terminals, to apply in different situations, with different individuals. Second, their conventions may be *more or less strict* and specify what *should* be done, what is *often* done, and what *may* be done in the frame. Third, the frames in which scripts are embedded may vary within certain boundaries and therefore also the respective actions of the script: If the restaurant has no waitresses or waiters but uses a counter to serve food, customers know that they have to take their food from the counter. Fourth, the notion of prototypical information involves normalcy and hence also exceptions, special cases, deviations, etc., which means that a script should have bundles of *alternative* courses of interaction as soon as a normal or preferred course cannot be

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[24]It might be argued that scripts *are* macrostructures, but this is not the way we understand the notion of macrostructure. Macrostructures are higher-level representations of information and hence also organize scripts (see Schank & Abelson, 1977, and their 'maincons'). Scripts however *also* contain low-level, detailed information about routines, so they cannot be identical with macrostructures. Macrostructures, hence, are typical 'processing units' (see Frederiksen, 1977), whereas frames are organizational units of semantic knowledge.

taken. The *actual alternative* chosen may depend on the particular *plans* and *purposes* of a particular agent, and the frame and script only specifies the *boundaries* of the possible alternatives.

These few remarks are meant to stress that a too static or fixed concept of frames and scripts would not be fruitful in a cognitive model, because in that case they would not fit the contextually variable forms of action.

6.6.7.   After this theoretical intermezzo about the organization of knowledge in memory, a discussion that of course could only make the most important distinctions involved, we must investigate how these kinds of knowledge are playing a *role in discourse comprehension* and especially how they determine *global* comprehension of discourse.

To understand the role of knowledge in discourse comprehension, it should be realized first that comprehending a *particular* discourse takes place in a *particular context.* This means that only the knowledge that is *accessible* in that context plays a relevant role. It may well be that in other kinds of situations a person has different access to this knowledge, given a different task or having different goals. Similarly -trivially but important-knowledge is not fixed but changes from situation to situation, also *during* discourse comprehension. This not only applies to the acquisition of knowledge *about* the text, as it is represented in episodic memory but also may involve more general and more permanent changes in our knowledge of the world. In the following we come back to this acquisition of knowledge due to textual communication.

First knowledge plays a role in discourse comprehension as more general knowledge about the *communicative context* of the discourse. A reader or hearer knows in what social context the discourse is produced and hence what possible speech acts, topics, style, and general aims and motivations may define this context. This general knowledge is added to the particular knowledge about the actual context (speaker, circumstances, etc.). We have seen earlier that such contextual knowledge generates expectations or beliefs about the (global) speech acts of the speaker and hence also about the global topics that are the semantic base of the speech act. If somebody, a stranger, approaches us in the street, we may expect a question or perhaps a request or important information but not an insult or an accusation, and therefore at the same time we know what the *topic set* of speakers in a particular situation is. This holds for parties, conversations in buses, psychological textbooks, etc. Hence the first assumptions about the possible or likely global topic of a discourse is generated by our general and particular knowledge about communicative contexts. This knowledge includes general conventions, frame knowledge, knowledge of categories (roles, etc.) of participants, personal knowledge of speakers, knowledge of personality traits, and associated stereotypical behaviour. Later we see in some more detail how all

those features are involved in the global comprehension of speech acts and interaction.

From the point of view of a processing theory we assume that the interpretation of the communicative context actualizes the kinds of knowledge mentioned before, by representing them in EM. As soon as they are needed, then, they may be transferred to the semantic processors of STM.

In the comprehension process of discourse itself, knowledge plays different roles. At the level of sentence comprehension, knowledge is first addressed for the recognition of words, word meanings, and syntactic patterns, a process that is not discussed here. The same holds for their interpretation, viz., construction of FACTS. General semantic knowledge involves knowledge about the possible schematic structures of FACTS, which categories and roles of participants are organized by state, event, and action concepts. For instance, the concept of opening involves an opening agent, an object that is opened and possibly an instrument with which the opening is operated. This knowledge makes it possible that some of the categories remain *implicit.* In understanding the sentence:

(13) He opened a can of peaches.

we know, implicitly, that he will probably have used a can opener. This implicit presence of the concept allows definite reference to the opener in a next clause or sentence. Note that this knowledge may be culturally variable: In our culture the concept of paying implies the exchange of money or checks s to obtain goods or services.

Interesting for a theory of discourse understanding is the role of knowledge in the establishment of connection and coherence between sentences. Comprehension of a given sentence activates concepts, frames, and /or scripts, specifying what the properties are of certain concepts mentioned in this sentence or what the possible following components or consequences are of an event or action. In that case, the implied FACT need not be expressed by the discourse and yet be necessary to establish connection and coherence:

(14) He went to the theatre, but he didn't like the play.
(15) He ran to the platform. The train was just arriving.
(16) He needed the book badly, but the library was closed.

To understand these sequences we must know that in theatres plays are performed and that we normally go there to see a play, that in a station we go to a platform and that trains arrive at the platform, and that books we need can be found at the library.

In terms of the processing theory the intervention of propositions of FACTS from our knowledge system means that these units must be brought into STM

to establish the connection and in general the coherence relation between the sentences expressed in the discourse. Although the first sentence may address, globally, a semantic field or a more particular frame or script, the reader does not know *which* proposition or FACT is needed, so there is merely an *activation* taking the place of the particular field, frame, or script, which allows fast access and instantiation of particular FACTS. The next sentence may then select the necessary item, possibly representing it in STM. This would mean that the STM buffer would need space to store this particular knowledge FACT. We have seen earlier that the capacity of the buffer indeed allows this: Until now we only had about five information units in the buffer: Two or three FACTS as expressed by the discourse, a MACROFACT, and possible schematic information.

The examples just given are more or less straightforward; that is, the first sentence unambiguously selects the right field, frame, or script. In other contexts and texts, isolated sentences would not be sufficient without the knowledge of the *topic* of the fragment or the *context* of the utterance:

(17) She took him under the tree, but the light was not strong enough.
(18) He called her several times.
       When she didn't come, he left angrily.
(19) Not so much please, because that would bump too much.

Such sequences are perfectly understandable however if we know that the topics are 'taking a picture,' 'ordering in a restaurant,' and 'having your tires pumped.'

From these last examples it also appears that the role of knowledge in discourse comprehension is not only limited to the establishment of local coherence. As shown in more detail before, the local coherence of discourse is a function of topic, that is, of macrostructures. The macrorules can apply only, however, if knowledge about the higher-order structuring of reality is available: DELETION can only apply if we know about the relative relevance of properties and events in the description of situations and episodes; GENERALIZATION requires knowledge about the hierarchical relations between concepts; and CONSTRUCTION especially requires knowledge about the normal conditions, components, and consequences of global events and actions. Of course, this knowledge about the actual macroproposition of a sequence may be induced by explicit topical sentences or titles in the previous part of the discourse. But even then, the reader must know that the subsequent sentences are indeed dominated by the macroproposition, and he therefore needs world knowledge.

If no indications about the probable topic are available, the reader establishes a hypothesis about the topic, as we just saw. With the information derived from the comprehension of a given sentence, a search in the relevant

domain of semantic memory is made. If the FACT is a component of a frame or script, it is provisionally assumed that the frame or script label, instantiated by assignment of a constant to the variable slots (x is taking a train => John is taking a train), functions as the macroproposition, at least until further notice. This macroproposition is kept in the STM buffer to monitor local comprehension of the discourse sequence.

If the FACT is not part of a recognizable frame or script, it is first evaluated with respect to world knowledge about more or less 'important' issues. Of course, these may only hold for the particular context: It may be a FACT that is important for the speaker and /or the hearer, dependent on the speech act and hence the goals of the communicative event. If it can be assumed that the FACT has this importance value, it will also be provisionally stored in the STM buffer, until clear evidence for another macroproposition is available. In our crime story fragment for instance it soon appears that the slim blond girl is not at all relevant in the story, so that this small episode, after initial global interpretation ('K looks at a pretty girl'), can be safely put away in EM.

The strategy for GENERALIZATION application is less straightforward. We have only a few FACTS in store and it may well not be possible to apply GENERALIZATION right away. As in the case for DELETION, however, the reader has knowledge about which specific inherent features of participants and actions or events are less likely to be further relevant in the discourse, so that he does attempt a provisional abstraction by the way of GENERALIZATION (' *a is slim*,' ' *a* is tall,' ' *a* is blonde' => '*a* is pretty').

The details deleted, abstracted from, or constructed away are stored, after the establishment of local connection, in Episodic Memory. This does not mean that they are no longer available (e.g., for reinstatement for the establishment of coherence or for correcting a macrohypothesis). Some detail may after all become more important than one thought. The relation between the detail propositions stored in EM and the macroproposition derived from them in general allows reinstatement of recent propositions, at least by *recognition*. Active *recall*, as we see shortly, of discourse details may be more difficult. Note however that again knowledge of the world may effectively help retrieval of details: The normal components of global FACTS of frames and scripts are known and may therefore be recognized by scanning the frame-script knowledge or actively be recalled by (re)construction. We later return to the various processes involved in retrieval of discourse information from memory as a function of macrostructures.

6.6.8.   The important role of world knowledge in the comprehension of complex information from discourse not only allows the interpretation of words, phrases, and clauses; the construction of FACTS; and the establishment of connection and local and global coherence (viz., the assignment of topics by macrooperations) but at the same time plays an important role in the construction of a *representation* of discourse in (episodic) memory. It would

be a mistake to think that language users build a nice copy of the semantic structure of the text, supplemented with the necessary knowledge to make this structure coherent.

First they probably apply a number of *transformations* on the information before it is stored, not only the usual macrostransformations already discussed but possibly also other operations, such as substitutions, deletions, or reorderings of details. Since these transformations may also occur in retrieval, we discuss them in Section 6. 10.

More important at this point is the fact that the reader constructs not only a representation of the text but thereby also *a representation of a fragment of the world* (viz, the fragment that is denoted by part of the discourse). The application of world knowledge in that case not only establishes coherence of the discourse representation but in different ways adds to the picture: Inferences are made; details are deleted that may not be understood; and other details may be explained.[25] In other words, the information from the text, as it is represented, in many ways is *adapted* to our knowledge of the world (and to other factors of our cognitive set). The reader not only stores 'what was said' but automatically tries to (re-)construct 'what happened' in the situation described by the discourse, and this 'understanding' of the discourse may involve many adaptations to knowledge and inferred expectations. We see that in this way not only surface structure may become relatively unimportant and hence irretrievable but also the semantic information of the text itself, which does not have a function of its own but which has a purpose to convey information *about* a possible world. The reader therefore constructs this part of reality, which of course conceptually speaking coincides on many points with the semantic information of the text. Especially the global information of the text (viz, the macrostructures), which do not have direct counterparts in reality but which are global interpretations of reality, in that case remain the semantic core of the text-world representation. We see shortly that this central and organizing aspect of macrostructures appears very clearly in recall.

Important for our investigations is the assumption that our knowledge of frames and scripts automatically *embed* information from the text in possible representations of the situation, context, and prototypical (other) actions, properties, and participants, so that the representation of a text, at least initially, is much *richer* than the text itself.

6.6.9.   Another obvious contribution of knowledge in the comprehension of discourse discussed (in Section 6.4) is the actualization of *superstructural schemata*. Besides the general knowledge of the language, we have knowledge

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[25]This link between discourse comprehension and world knowledge ('schemata') has already been recognized by Bartlett (1932).

about possible discourse forms: We know how a normal story looks, and we recognize an argument, a newspaper article, or a psychological paper when we see /read one. We have seen earlier that in many cases the communicative context (e.g., situation, social frame, or speech act) already generates expectations about the type of discourse and hence also about possible superstructures. Without this assumption a reader /hearer must guess by the *content, style*, and other textual aspects (e.g., layout) or channel properties which global schema is involved or try to establish inductively which *category* of such a schema is actualized and hence which possible schemata are relevant here. In general, however, the reader /hearer has serious expectations about the discourse type and therefore about the schema, so that his discourse knowledge enables him to actualize the respective categories. These are, respectively, stored in the STM buffer, to keep track of the functional role of the corresponding macroproposition of a text fragment.

The hypothesis probably actualizes a *canonical* structure for the relevant discourse type. Only if the information of the discourse does not fit the successive categories of this canonical structure, will the reader actualize other categories. In EM, however, the representation, may even in that case, become canonical again.

6.7. COGNITIVE SET IN DISCOURSE COMPREHENSION

6.7.1.   Both the local and global comprehension of discourse is a function not only of the knowledge of language users but also of a number of other important cognitive factors. It seems obvious, and it has been demonstrated in social psychology, that the way we understand and store information is determined also by our actual *needs, wishes, wants, desires, preferences, purposes, intentions, obligations /tasks, interests, beliefs /opinions, norms, values, attitudes,* etc. The number and cognitive complexity of these factors, and the fact that many of them may be predominantly personal, makes it extremely difficult to give an exact account of the representation of discourse in memory, at least in *natural* communication situations. In experimental setups in the laboratory, the relevance of a number of these factors may perhaps be reduced, but even then it is difficult to cancel certain basic interests, norms, etc. Moreover, it is well-known that subjects in the laboratory have assumptions about the pragmatic nature of the context: They may believe what the experimenter wants them to report. On the other hand, if ever we want to have real insight into discourse processing, we must know how this takes place in natural contexts of communication, and so we must know the interaction of the various factors with the representation of discourse in memory and the comprehension processes on which this

representation is based. It is obvious that it is far from easy, if not nearly impossible, to control the respective cognitive factors just mentioned.

Yet, apart from these practical difficulties of experimentation we may make some more general theoretical remarks about the various factors involved. Of course, each of them would merit extensive discussion on its own, but that cannot be the task of this section or this book. It should be stressed that the actual rather exclusive interest for the representation and application of knowledge in information processing is one-sided as long as other important cognitive domains are neglected or arbitrarily left over for social psychology.[26]

6.7.2.   Just as this is the case for knowledge, the factors mentioned previously are relevant in discourse processing only for particular contexts of communication, because they may change from context to context. This does not mean, of course, that they change completely, because for each language user we may assume that there are more or less general or permanent preferences, beliefs, attitudes, etc. Similarly, although the factors may be different for different individuals, there are also beliefs, norms, and attitudes that are shared by a whole group, community, or culture. The overall present state of the cognitive system, consisting of the various systems just mentioned, in a certain context has been called the *cognitive set* of the system or person. The notion of 'set' in this case is equivalent to the German notion of 'Einstellung.' The cognitive set of a reader, then, is what the reader *now* knows, believes, wants, intends, thinks, finds, etc. The cognitive set as a whole determines his comprehension and representation of the discourse read in that context at successive moments of time.

To simplify matters a bit, let us first try to classify the various factors /systems in somewhat larger groups.

First, we capture the whole group of needs, wishes, wants, preferences, and desires as the general *motivation set* of a person. It determines above all the actions and other behaviour. Next, we have the decisions, purposes, and intentions that underlie the actual actions, determining what result states and goals the individual wants to reach by these actions. Since we reserve the notion of *plan* for higher-order intentions (see following), we use the term *design* for the set of factors underlying actual actions. A task is also part of the design, because it is an aim of the agent, which may also be determined by the wants of others. Cognitively, this task is not different from ones own aims,

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[26]For a recent treatment of some of the notions discussed here, see Fishbein and Ajzen (1975). A more cognitive and 'schematic' account of these notions is given already in the textbook of Stotland and Canon (1972). On the other hand there are some recent developments in cognitive psychology that point at a fruitful combination with issues in social psychology (e.g., in Carroll & Payne, 1976, and Abelson, 1976). See also Freedle, Naus, and Schwartz (1977).

only the underlying motivation may be different (not all tasks are wanted). Next we have the central system of knowledge, beliefs, and opinions, which are another fundamental set of properties of which knowledge has already been discussed. Beliefs, as we saw earlier, may have a more personal and subjective nature, but cognitively they need not be different from knowledge; knowledge is rather a sociopsychological notion: It denotes beliefs that are correct, true, or justified according to the speaker and the criteria of a culture. The whole set involved is simply called that of *belief*. Beliefs, however, may also contain evaluations: In that case it is not what the person *thinks* to be the case but *finds* to be such and such, which includes a value judgment based on certain *value scales*: *a* is nice, *a* is beautiful, *a* is ugly, *a* is stupid, etc. Of course the transition of such predicates to simple descriptive predicates is not sharp: We may both *think* or *find* that one is happy, tall, etc. The system of beliefs where evaluations are involved is that of *opinions*.

Finally we have three *general* systems: values, norms, and attitudes. Just as we may have beliefs about actual facts, we may have general beliefs, of which general, conventional knowledge has been discussed earlier. Similarly, we may have certain tasks, based on imposed obligations; these, however, may also be general and pertain to our actions in general: what should be done or not done in certain situations. Just like general knowledge, such a general system of *norms* is culture-dependent. Similarly, the general *value* system is the correlate of actual opinions and evaluations. Finally, the rather complex notion of *attitude* also involves values and at the same time norms and beliefs. Just like norms and values, attitude has a *social* character. An attitude is a *global organization* of cognitive factors with respect to specific socially relevant persons, objects, or issues (blacks, nuclear energy, etc.). In this respect it is, so to speak, the general variant of the notion of cognitive set.

Of course this brief discussion and classification does not, by far, exhaust the specifics of the notions involved. We merely want to establish some elementary distinctions and some basic classes of cognitive systems, so that analysis of their functions in discourse comprehension -and of course in interaction- becomes easier. The classification we have could be rendered as in Table 6. 1. We have kept the diagram very simple. Tasks and norms have been taken as the necessary (obligatory) part of designs and conventions: what a person or people in general *ought* to do. Note also that the various *emotive factors* have also been taken as cognitive factors (e.g., desires and wishes are part of the Motivations and love, hate, anger, etc., have been summarized by Emotions). We do not exclude that the system of emotions can be worked out on its own, but here we take it in the general cognitive framework (viz., in relation to other cognitive domains); as such, then, emotions may be part of motivations and therefore underlie actions. For instance, emotions are acceptable as reasons and explanations for actions ('John hit Peter because he was angry'). Indeed, if we read the diagram from

TABLE 6.1,
Cognitive Set

Particular/Personal	General/Social
Belifs	Knowledge
Opinions	Values
Motivations/ emotions	(Social needs, etc.)
Designs/ tasks	Conventions/ norms

top to bottom, we discover that it is at the same time a model for the underlying structures of action. Reading discourse and participating in interaction, two main topics of this book, seem therefore to be framed roughly by the various domains mentioned in the diagram. If we take the same example, we may follow the underlying sequence:

(20)   (a) John *believes* that Peter offended Mary.
        (b) John *finds* that offences are unacceptable ('not good').
        (c) John becomes *angry*, so he *wants* Peter to be punished.
        (d) John *decides /aims /plans* to hit Peter.

We return later to this underlying structure of action when we discuss the global properties of action production.

Note also in the diagram that *attitudes* are at the border of personal and social cognitive systems, encompassing the various domains and pertaining only to certain social aspects (e.g., crucial, controversial ones). Attitudes have *schematic* nature: They are the general, higher-order, organizing principle of our beliefs, opinions, motivations, and designs. They determine what we know/ believe about blacks, fascists, imperialists, communists, forced busing, etc.; what our opinions are about these; what we would want or prefer to be the case regarding them; and what actual actions we would design with respect to them in concrete situations. We see that they are highly complex, involving macropropositions, frames, and scripts. Whereas the other domains are *systems*, we have here a form of an *intersystem* that collects general items, both personal and social, from the other systems.

This very brief discussion of some other factors of the cognitive set must be ended here, so that we may focus attention again on the process of (global) discourse comprehension. It should merely be noted that we do not claim that the cognitive set as just discussed is complete nor are these factors the only ones that interact with discourse comprehension. We have briefly mentioned further emotive factors. The same holds for the various factors of *personality*, which is also a highly complex, socially and contextually dependent, system; it is the global *function* of which the respective emotive and cognitive set factors may be values, for different arguments (i.e., persons) of the function.

This mathematical metaphor underlies dependencies like: Because of her *insecurity,* she could not *believe* that her friends would like to see her, so she *found* them unreliable friends and did not *want* to visit them, so she *decided* to stay home. These relations between cognitive set and personality are not discussed here. If there are relations between personality and global tendencies in the comprehension of discourse, such as tending not to believe what is said, or tending to think that what is said is exaggerated, this link plays a role via the elements of the various cognitive systems. Further research will have to reveal these (indirect) links between discourse production/comprehension and personality, however, especially since certain aspects of discourse, such as *style*, are usually considered to be valid indicators of personality.

6.7.3.   How do the various cognitive set factors/systems interact with discourse comprehension? Our basic assumptions in this case are similar to those of the interaction of knowledge (which is, after all, also part of the cognitive set) in interpretation and representation, as previously discussed: The factors determine initial interpretation of sentences, establish connections and coherence, influence the application of macrorules, and finally determine the representation of the discourse in memory. Again, this representation is at the same time an (indirect) representation of the world, as conveyed by and inferred from the discourse. This means that the usual motivations, opinions, and attitudes operate, *as if* they operate directly with respect to observation of the world: John will also become angry if he *heard* that Peter offended Mary.

First, the cognitive set may be of relevance for the *communicative situation* as a whole and the kind of discourse involved: Participants may not be very interested in a lecture, have a low opinion of the speaker, and hence have little motivation to hear, understand, etc. The converse also holds and defines the specific *interest* and *attention*, which are cognitive operations of *focusing* on certain discourse types or topics. In this case, all kinds of other cognitive activities may become marginal, so that comprehension and evaluation of the discourse becomes a primary plan. The same may hold when a specific *task* is set (e.g., when reading a certain discourse has specific goals, say, to perform an action for somebody else, as in the laboratory experiment, or to obtain specific results or solve a problem). In all those cases, the whole process of comprehension is *globally* determined by a number of predetermined set factors.

At the *local level* the cognitive set factors allow specific attention and processing of certain sentences: They may be assigned *specific relevance*, given the specific tasks, interests, or opinions of the reader. This may in turn be a condition for macrostructure assignment if the reader thinks a FACT is also important for the understanding of the discourse as a whole. Thus, in our

crime story example, Ks looking at a pretty girl is, as such, a minor detail that at least required generalization and construction toward a frustration topic. At the same time however the same event may be interpreted as an instance of general male behaviour, which may be evaluated as chauvinist at higher level. This interpretation is even preferred as soon as the specific task of the reader is to study the role of women in contemporary American crime stories. Similarly, in the Berlitz discourse, our evaluation of the function of business careers may well determine our comprehension of the sentences in the ad about this motivation for learning a foreign language and may thus influence our evaluation of the Berlitz method. Finally, in the text about the Supreme Court's decision in the Bakke case, opinions play a very important role in comprehension because a relevant social problem is involved. Depending on the attitude of the reader, attention may be paid more to the arguments in favour of or those against the decision of the court.

In the interpretation of sentence connection and coherence the elements of the cognitive set may also play a decisive role: FACTS are related not only according to general knowledge and beliefs but also according to opinions about the conditional relationships between FACTS. In such a case the following texts may well be judged to be less coherent, depending on the attitude:

(21) The court gave Bakke a personal victory, because it is part of white power and establishment in the United States.

(22)   The court ruled that ethnic considerations may play a role in admission schemes, because it considered that equal opportunities in education should be promoted.

Thus, sequences of facts as represented in a discourse can be taken not only as possible or probable but also as being socially desirable or not. Since each reason is based on a general statement that warrants it, the acceptation of the connection depends on the presence of the general statement in the cognitive set. If this is not the case, the connection may be judged inconsequential or a general conclusion may be made, by GENERALIZATION, about the opinions of the writer/speaker.

From these few examples we see that the interaction of cognitive set factors often pertains to the *macrostructures* of the discourse or leads to the formation of different macrostructures. First, cognitive set factors (like attitude, interest, or task) may determine specific attention for certain *topics*. Second, the assignment of specific relevance, due to a task or to opinions of the reader, may result in the assignment of global importance to a proposition, which thereby becomes a macroproposition for the reader. *In other words, the assignment of macrostructures to a text depends not only on the general semantic properties of discourse and the indications in the text*

about the intentions of the speaker/ writer but also on what the reader/ hearer **finds** *important. T*his importance is defined in terms of specific beliefs, opinions, interests, action design (goals), and general norms and values. Finally, certain topics of a text may receive *further interpretation* by assignment of a general *evaluation* or the construction toward a higher-level social or political *frame* (e.g., in the case of the decision of the Supreme Court).

Instead of having a further interpretation, this interaction with the cognitive set may also result in alternative macrostructures. The text about the Supreme Court's decision in that case may also be assigned a macroproposition like 'Discrimination of whites is unconstitutional' or 'Ethnic minorities may still profit from admission schemes,' depending on the opinion of the reader about this issue. In both cases the macroproposition about the court's decision is seen as a condition for this new, more relevant, macroproposition.

6.7.4.   The basic principle determining storage of information in memory is the structure assigned to the discourse during comprehension. Hence, if this structure depends on factors of motivation, beliefs, opinions, design, or attitudes, the representation will also have this 'biased' nature. The internal structure of the discourse in EM is dependent on the macrostructures formed before or during comprehension as a function of cognitive set information. In addition to that, it may be the case that besides the *interpolated* information necessary to understand the text (e.g., by establishing local and global coherence) other information from the cognitive set could have been actualized and stored in EM, e.g., certain expectations or possible evaluations. The definite representation, therefore, is no longer only a more or less neutral or 'biased' text structure, as assigned in STM; it also contains all kinds of other elements that became relevant in the interpretation context. We see later that this accounts for the finding that, in various kinds of reproductions of read materials, subjects tend to change and add new information. Of course part of these transformations may also take place during retrieval and reproduction, which are a function of the cognitive set of the production process.

At this point it is necessary to look back briefly at our results. Instead of a more or less correct replica of the semantic structure of a text in memory representation, we have found first that this representation is possible only due to the decisive interaction of knowledge during comprehension, and the possible presence of knowledge fragments in EM. The representation, thereby, is no longer merely a representation of the discourse; it is also a representation of the world fragment (situation, events, actions, etc.) it denotes. At the same time, other factors, such as motivation, designs, beliefs, opinions, and attitudes, play a role, also both in comprehension and in the

final embedding of the representation in EM. These factors may sometimes considerably affect the attention, selection connections and especially determine what is relevant in the discourse for the hearer, which implies the additional or alternative assignment of macrostructures. Similarly, the discourse is interpreted relative to the (global) speech act and with respect to other aspects of the communicative context, which also affects the assignment of macrostructures, and the global organization of the text in EM.

6.8. RELEVANCE ASSIGNMENT
IN DISCOURSE COMPREHENSION

6.8.1.   On several occasions in this book we have used the term *relevance*. In this section we briefly summarize what different aspects are involved in the assignment of relevance during discourse comprehension and further observations that are necessary in the framework of a theory of macrostructures.

It makes sense to distinguish at least two basic sorts of relevance, viz., *textual* and *contextual* relevance. An element of a text is textually relevant if it is relevant with respect to other elements of the text and contextually relevant if it is relevant to elements of the communicative context (e.g., the pragmatic context), the cognitive context, or the social context. We have discussed both types of relevance in the respective chapters. We also notice that the notion is *relative*: It is defined only with respect to other elements.

Relevance is taken as an *interpretative* notion: It is *assigned* to elements (e.g., expressions like words, phrases, sentences, sequences of a text) or, at a higher level, to interpretations of these. This means that relevance may be defined in semantic or in pragmatic or in cognitive or in social terms.

6.8.2.   Semantic relevance may be defined at the *local* and at a *global* level. At the local level for instance it would mean that certain concepts are more relevant than other concepts (e.g., within the sentence). Since relevance is relative, this means that difference in relevance needs to be specified with respect to other concepts. Such a distinction, within the sentence, does not seem generally appropriate, however. Of course, we have the distinction between *topic* and *comment*, discussed in Chapter 2, but although we might say that the comment provides 'new' or 'unexpected' information, it would not be straightforward to speak of a difference of relevance in that case. Rather, we should reserve the notion of relevance at least to FACTS.

This means that semantic relevance should be defined at least at the level of clause or sentence relations. Indeed, if we take the hierarchical organization of the complex sentence as an indication for relevance difference, structurally represented by *subordinate* and *superordinate* clauses, we may say that a text

or a writer may indeed manipulate relevance differences by the hierarchical structuring of sentences. Note that this would merely be a *structural* kind of relevance: Contextual factors may well decide that the relevance distribution is different in such a case.

6.8.3.   Although in principle we reserve the notion of relevance for FACTS relations, we might see another linguistic phenomenon also as a kind of relevance assignment, viz., semantic elements foregrounded by elements such as heavy stress or intonation or special printing devices. This kind of structural (textual) relevance is called *contrastive*, namely, with respect to the structure in which such relevant elements are embedded:

> (23) Give me an *apple*. I don't like *pears*!
> (24) You call that a *teacher*!?
> (25) What I need is a *bed*!
> (26) *Amsterdam* is a town you should see.

In those examples the contrastively relevant concepts are expressed by specifically stressed words or by syntactic constructions, like (pseudo-)cleft or topicalization. The relevance involved may be differentiated according to whether an opposition is involved; concepts of the same class are compared; the use of a certain concept is appropriate for a certain object, person, or event or-cognitively-because a certain object, etc., needs special *attention.* There are many other grammatical ways to indicate this kind of conceptual relevance at the local level.

6.8.4.   Focusing attention on intersentential relations and global structures, the assignment of relevance first plays a role in the *connections* between sentences. In the same way as there are semantic differences between the relevance degree of clauses within the sentence, such differences may play a role in the sequence, although there is no syntactic-hierarchical-marking of this difference in that case. However, the connectives may very well indicate that some FACT has primary importance and another FACT is semantically subordinated. This may for instance be the case when one FACT is a component, a property, a condition, or consequence of another 'main' FACT:

> (27) John won't come tonight. He is ill.
> (28) The crop is destroyed. There was too little rain this summer.

Also the ordering of the sentences may signal in this case that the first sentences expresses the main FACT of the sequence. The other FACT is mentioned only as an *explanation* of that FACT. We see that also the

functional relations between propositions are involved in differential relevance assignment: Auxiliaries, specifications, explanations, etc., often count as subordinated functionally to a 'main' FACT, which thereby has *sequential* relevance.

6.8.5.   The central aspect of semantic relevance assignment takes place at the *macrolevel.* The intuitive notion of relevance or importance is initially explained by the very notion of macrostructures. The macrorules by definition define what is semantically relevant for the text *as a whole*, so that we here should speak of *global* (textual) *relevance*. The macrorules precisely select the propositions that are relevant for the *interpretation* of other propositions in the text; it assigns relevance by generalization and constructs relevance due to the joint combination of FACTS in a global FACT. This constructed macrostructure, at various levels, is an abstract definition of how meaning(s) of a text are *hierarchically* related, the highest levels being the most relevant, because they determine the interpretation of the text as a whole. Recall that relevance in the DELETION rule is defined in terms of *interpretation conditions* (or presuppositions): A proposition p is relevant in a sequence E if it is a necessary interpretation condition for any other proposition in E; in that case the other proposition could not be interpreted either intensionally (it would be partially meaningless) and/ or extensionally (it would have no truth values or satisfaction).

6.8.6.   *Pragmatic relevance* of elements in a text is a kind of contextual relevance assignment. It means that an element is particularly important in the accomplishment of a particular speech act. This may be a stressed performative verb, certain particles, or other pragmatic indicators of sentences. More interesting for our discussion however is the *relevance of a speech* act with respect to other speech acts. In such an analysis we would have similar procedures as for propositions: subordinate or auxiliary speech acts with respect to main or superordinate speech acts, or the formation of global speech acts in discourse, as we see in Chapter 5.

6.8.7.   Finally we have various kinds of *cognitive relevance* assignments in discourse comprehension. These would first be based on the structural properties of the discourse (viz., by the assignment of structural hierarchies in the representation) as discussed previously. At the local level this might also involve special attention for certain words or even surface characteristics (style), whereas globally the cognitive relevance would primarily be accounted for in terms of macrointerpretations. Recall that the assignment of relevance to FACTS in comprehension also involves world knowledge: Important facts (e.g., those with many and/ or serious consequences) are contextually or generally known to the reader.

Next, the other factors of the cognitive set each determine what is more or less relevant for the *reader*, because here the personal motivations, designs, opinions, and attitudes are involved. We have seen that relevance assignment in that case need not be parallel to the structural relevance indicated by the text: Certain concepts, FACTS, FACT-Connections, and topics may be selected or constructed that are in accordance with the purposes of reading, general interests, or particular opinions about them.

In terms of representations of discourse in memory the different relevance assignments may be defined first by the structural values discussed earlier: An element with a high structural value would in that case be more relevant. But this kind of relevance would rather be 'internal.' In the same way the number of relationships with elements of knowledge or other factors of cognitive set could play a role. The more links an element would have with the knowledge structure and with the purposes, opinions, etc., of the reader, the higher would be its (contextual) relevance.

In this perspective we should finally mention the possible relevance of the so-called *salient detail*. We have seen now that, by personally variable properties of the cognitive set, different readers may find different elements of the text relevant, which also shows in further processing and recall. However, it may well be the case that in some context, and in an apparently ad hoc way, some detail of a text-or in general in perception and information processing-is salient for the reader although it cannot be accounted for in terms of specific purposes, interests, attitudes, or other cognitive factors just specified: It may be just a structurally irrelevant detail that nevertheless is 'striking.' Although we do not want to exclude explanations in completely different terms, we would nevertheless imagine that cognitive (emotive) factors are involved (e.g., evaluations) which cannot be made explicit or accounted for consciously by the reader or which depend on rather ad hoc properties of the input process (chance perception and attention, etc.).

6.9. DISCOURSE COMPREHENSION AND COGNITIVE CHANGE IN LONG-TERM MEMORY: LEARNING, OPINION, AND ATTITUDE CHANGE

6.9.1.   Interesting from many points of view is the question about the further fate of discourse information in memory. We have sketched, very roughly, how discourse is understood and represented episodically, but may be expected that some of this episodic knowledge is also stored more permanently in 'semantic' memory. According to current memory theories this would involve several processes such as *abstraction* from the contextual nature of the information input, *generalization* over several instances of

similar episodic memory structures, and finally *integration* into the more permanent system of semantic memory.

These processes, however, are poorly understood. Yet, they are involved in such important cognitive events as *knowledge formation* or *learning, opinion* and *attitude formation* and *change*, and the construction of value and norm systems. Much of what we know, have learned, or have opinions and attitudes about has been acquired by textual communication. The question therefore is how comprehending discourse leads to learning and other cognitive changes in LTM. We are not able to go into detail about this fundamental issue, which has been somewhat neglected in current research on discourse comprehension, although from the point of view of educational psychologists such problems in discourse processing have primary relevance.[27]

6.9.2.   Some insight into the nature of UM has been acquired in the study of conceptual *organization* of semantic memory, in terms of semantic relations, frames, scripts of knowledge, and similar organizational patterns for other cognitive systems. To add or change information in LTM we therefore must take into account that in principle this transformation must be carried out under constraints of organizational principles. This is witnessed by the fact that we simply cannot learn anything. A main constraint, for instance, would be effective *retrievability* of acquired information. In other words, when we talk about the specific kind of storage of information in LTM that we call learning or similar changes in other cognitive sets, we imply that this information can, when necessary, be retrieved and applied. If not, we say the information is 'forgotten.'

Next, it makes sense to distinguish between two kinds of (more or less) permanent knowledge in LTM, knowledge about *actual facts* and knowledge of *general* principles, rules, laws, etc. An actual fact is defined in terms of its possible world coordinates, whereas more general properties of possible worlds, situations, events, and actions and their underlying regularities have a more abstract nature. The addition/change of information may thus be operated by adding new facts and by adding new generalizations.

New facts can be generated by the memory system in two ways: by comprehension of input (discourse, perception) and by derivation and by

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[27]The more specific problem of 'learning from discourse,' based on insight into discourse comprehending processes, has been noted already in Carroll and Freedle (1972). The problem has been discussed by such educational psychologists as Rothkopf (1972), Rothkopf and Billington (1975), Gagné and Rothkopf (1975), and Frase (1967, 1972, 1973). See also the contributions in Anderson, Spiro, and Montague (1977) and Wyer (1974). Note that we make a distinction here between 'acquiring information from discourse' (i.e., constructing textual representations [of an episodic kind]) and proper 'learning' as the acquisition of more permanent and general/ semantic knowledge.

rules or operations, from other facts. Although this is far from an adequate characterization of the notion of learning, we might make some more specific speculations about the process of knowledge acquisition from discourse.

Whereas the episodic representation of the discourse itself, plus the 'embedding' information about the context and the knowledge or other cognitive information actualized during comprehension, is still attached to the contextual 'uniqueness' of that particular discourse, we must assume that semantic information is more systematically distributed. At least most of our knowledge is not retrieved back via memory for that particular discourse; if so, however, this would be part of episodic information. The question now is how the episodic information is operated upon such that more permanent and more systematic storage is possible. The problem thereby is that experimental evidence is scanty for the solution of such an issue: As soon as we have recall experiments for discourse, we address episodic storage; only in longer-range learning experiments could we see which information from the discourse has been 'abstracted from' and stored systematically.

6.9.3.   It makes sense to assume that the acquisition of knowledge from discourse is a function of the structure of the discourse representation in EM. In other words, it seems plausible that the information that has for instance highest structural value, because of its many links with other information, would be a good candidate for a transformation process whereby it would be added to our knowledge system. Since knowledge acquisition, at least learning, presupposes retrievability, we may safely assume that when information cannot even be retrieved-either by recognition or recall-it does not constitute a part of general knowledge either. Lower-level microstructures only occasionally can be recalled and only in immediate recall. Long delayed recall just preserves the higher-level macrostructures plus some salient detail and 'personal notations' from a text. From these results, to be discussed further later, we conclude first that the probability of learning is directly correlated with the macrostructural level or in general with the structural value of information from discourse as acquired during reading. In other words, what is learned from a text is in principle related to what is recalled best and most permanently (viz., its *macrostructure*).

Thus, having read the text about the Bakke case, we first remember having read it in this or that newspaper or weekly and its major topics. Later we just remember that (we once read or heard that) the Supreme Court has made a particular decision in the Bakke case. Many Americans (and interested people from other countries) will have factual knowledge about this case when reading a (new) discourse about it. This means that their knowledge about this issue may be changed. This change is based on the information in the text and in particular the new information; that is, much of the text in fact *recalls*

the major properties of the case. This information about 'history' and 'background' of the case has a double function: For readers who do not know the issue, it allows the construction of a minimal knowledge base with respect to which new knowledge can be stored and, before that, the text can be understood. For other readers it serves to actualize the knowledge from LTM also necessary to understand the discourse; but at the same time it provides the locus and basis of the transformation process: The reader will know *which* information must be added (viz., information not yet stored) and *where* it must be added (viz., under the label of the Bakke issue). It is likely that this knowledge subset is not arbitrarily stored but linked with social and historical knowledge we have about American blacks and other ethnic minorities, civil rights, equal chances in education, etc. How *this* kind of general information is organized and accessed is largely unknown, so that precise assumptions about learning cannot yet be made. We may however assume that the reader will add relevant information (e.g., the fact that the Supreme Court made a decision in this case and that Bakke was admitted but at the same time that admission programs may take ethnic considerations into account). We have seen that this is roughly the macrostructure of the text and also that this macrostructure may differ according to the attitudes of the reader on this issue or on the issue of ethnic minorities in general. Low probability of being acquired more or less permanently would have the information that the court was divided; still lower would be how the judges were voting and what the arguments were for the vote. On the other hand, we may recall a salient detail (e.g., the fact that one of the judges was appointed by Nixon), which generates assumptions about the possible political stance of the judge. Important for our discussion is the following: Information that is highly relevant in the text-according to the criteria and levels spelled out in subsection 6.9.2-will have a high structural value and may therefore also have high *relevance* in the knowledge system. Hence, if our knowledge about the divided vote of the Supreme Court and other details of the vote or the argumentation is not systematically linked with other knowledge information from LTM, then the probability of learning will presumably be rather low. Thus, knowledge about the courts decision may be directly linked with knowledge about: (1) the general political stance of the Supreme Court and in particular about civil rights; (2) black struggles for equal opportunities; (3) admission schemes for universities; and so on. Hence, we assume that the following properties of discourse representation will, separately or concurrently, have relatively high chances of being integrated into semantic memory:

(a) semantic macrostructures;
(b) other structures with high structural value;
(c) structures related with much actualized knowledge;
(d) salient details.

Note that the high structural value may also pertain to other factors of cognitive set (e.g., specific tasks, interests, and opinions). Important here is of course the actualized knowledge system. If information in a text is very intimately related to LTM knowledge, as is the case in the Supreme Court text, we may assume that this information is also acquired. On the other hand, if little factual knowledge has been actualized, chances of learning may be lower: From the crime story and the Berlitz text, for which little factual knowledge was required in comprehension, we do not seem to have acquired general knowledge about facts or principles.

Crucially important is the general principle dominating the four kinds of information previously mentioned (viz., the *functional relevance* of the information in memory from the point of view of the reader). This relevance may take various forms:

(a) acquisition of a general rule or principle, which may explain other facts;
(b) generalization of a fact;
(c) connection with other particular facts (thereby serving in the comprehension of these facts);
(d) ordering or reordering of extant memory information.

In other words, we assume that, in general, the memory system has a selection procedure based on functional considerations: lf it is assumed that information can be used later, it will have a higher probability to be acquired.

There is another, communicative, condition underlying this functional principle. A reader in general also knows about the intended speech act and other aspects of the communicative context; that is, he knows when the speaker wants him to know something, as in all assertions, and in addition knows when the information is merely *contextually relevant* or also *generally relevant*. In most utterances of everyday conversation we obtain information about details that we know we need not recall later. Only those facts are selected that give us crucial new facts about the speaker, about other persons, or about the world in general, facts that we need for *adequate later interaction.* Thus, news in the paper is known to be relevant in order to understand later news about the same issue and to have a necessary minimal knowledge of what goes on in the world. The same holds for scientific papers and textbooks. In other words, for some discourse types and communicative contexts the overall condition of understanding already points toward more permanent storage, whereas in other cases no such function is involved (e.g., from stories we need not acquire permanent knowledge nor from advertisements).

Now, although we know practically nothing about systematic knowledge acquisition in LTM as far as discourse information is concerned, we seem to

have met some elementary principles that are very similar to those underlying comprehension. We have assumed that macroinformation especially is to be stored, representing the more 'important' information of a text. Second, we have seen that information that is *best* understood, while connected with much actualized knowledge, may be stored. Third, information that is contextually intended to be known receives specific attention. Fourth, functional relevance in memory is a decisive factor in learning. This functional relevance is higher if it organizes more information. So, general principles, laws, and general facts are well-established as long as they dominate many other facts. Thus, if I have some general insight into the political power relations in the United States, I understand particular facts about ethnic discrimination better, and so on until still more particular levels. Hence, if a text provides information that in this respect can have a high relevance degree in LTM, it has a high probability of storage.

The converse will probably hold in *changes of knowledge*. If the knowledge we have is inconsistent with new information, it will be most difficult to replace the information that had highest relevance: principles, general facts, etc. Repeated counterexamples or demonstration that the original belief was false (by arguments that are acceptable) are necessary to achieve such transformations.[28]

There is an aspect of knowledge acquisition from discourse that has been neglected in the previous discussion, viz., the assumption that the formation and change of knowledge depends on a process of *acceptance*; that is, language users will subject incoming information which is pragmatically embedded in speech acts of assertion to an evaluation which determines whether the information is true, correct, justified, etc. Such an evaluation depends on a comparison with existing knowledge and on beliefs about contextual factors, such as the communicative context type (e.g., bar versus classroom); the role, personality, and credibility of the speaker; and properties of the cognitive set (interests, wants to believe, etc.). Thus, information not only may be represented in episodic memory according to its content and structure but also may be assigned various probability, credibility, or acceptability values. Since the notion of knowledge involves truth or justified belief, information must first be accepted as true or justified before it can be added as knowledge in semantic memory. We ignore however the precise processes involved in this acceptance and evaluation of information.

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[28]This is a well-known result in social psychology about opinion and attitude change, explained in terms of 'cognitive consistency' or the avoidance of 'cognitive dissonance' (Festinger, 1957). For other work in this area, see Himmelfarb and Eagly (1974) and Fishbein and Ajzen (1975). See also Wyer (1977).

6.9.4.   At this point we come close to the well-known problems in social psychology about the formation and change of *opinions* and *attitudes*; that is, how do the other systems of the cognitive set change due to the processing of discourse?

The principles involved in the formation and change of other cognitive memory systems are similar to those determining knowledge. The evaluations of FACTS during discourse comprehension, as they are also represented in EM, yield possible items for transformation of our opinions. Since we may assume that the knowledge system is systematically connected with the other systems, these evaluations pertain mainly to the global FACTS of the macrostructures of discourse. In that case it is likely, for instance in the example of the Supreme Court text, that an opinion about the decision is stored in memory rather than more detailed local evaluations of the respective arguments of the members of the court. Second, those opinions are especially favoured that are relevant to the opinion system: As soon as an opinion globally organizes other opinions, explains other opinions, provides necessary connections to make the system cohere better, these probably are acquired.

As is the case for knowledge the converse also holds. Change of opinion is more difficult as soon as higher-lei/el opinions are involved. It is easier to change our opinion about a particular judge than the general opinions about the necessity of blacks' civil rights or equal chances in education. These general opinions are part of attitude systems that at the same time involve general knowledge, general values and norms, and basic principles in our designs for action. As soon as these higher-level items of the memory system would change, either we would find incoherent systems or we must change all subordinate items.

It may be assumed that in general it would be very difficult to change higher-level opinions or even whole attitude systems on the basis of one discourse. Persons would require many independent information units before they are willing to abandon such general principles that organize large parts of their cognitive systems;[29] or else other factors should play a role, such as the esteem or credibility of the speaker and the nature of the facts and argumentation of the discourse. If the facts and the argumentation are judged to be true and valid but if the opinions associated with them do not cohere with the opinion and attitude systems, a *strategy* must be followed if the systems are not to be changed due to the information. An explanation will be sought about why these facts are true and why the speaker gives the

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[29]The arguments in this section, being well-known in social psychology, of course hinge upon the assumption that semantic memory is systematically organized (e.g., at least in part hierarchically). This does *not* mean though that *all* information is systematically organized or that processes of retrieval/ reproduction are always systematic. This makes precise experimental predictions difficult (see Kintsch, 1974).

argumentation, in such a way that the existing opinions and attitudes need not be changed.

It is not our task in this chapter to provide a theory of opinion and attitude (trans-)formation. We merely would like to stress the following aspects resulting from our earlier discussion that may be relevant for such a theory:

(a) The (trans-)formation of cognitive systems due to verbal communication is a function of the discourse representation in memory; this means that only certain kinds of discourse informations (e.g., macrostructures and related opinions) are likely candidates for these (trans)formations.

(b) (Trans-)formations are in principle functionally relevant in the sense of being necessary conditions for the maintenance of coherence in the systems and, indirectly, for adequate future behaviour.

(c) (Trans-)formation is a function of the (hierarchical) organization of the cognitive systems: Higher-level items will have lower probability to be changed.

(d) (Trans-)formation is also a function of the relatedness of cognitive systems: A general opinion, thus, is easier to change than a complex general attitude, which would also require changes of beliefs, norms, designs, etc.

Especially from the first point we may conclude that further developments in the theory of opinion and attitude formation should have a powerful cognitive component in which the respective comprehension processes of discourse are accounted for. Without such a component, it cannot be understood why certain information in discourse is more likely to be memorized and hence which opinions depending on that information may be formed or changed. Moreover, such a component should specify how, during comprehension, the 'structural' comprehension of the discourse is linked with the interaction of complex factors of cognitive systems (e.g., opinions about the speech act, the speaker, the social context of the utterance, and the specific interests, tasks, and attitudes of the reader). Further work in social psychology and mass communication in this area therefore should take into account the results of a cognitive theory of discourse processing.

6.10. RETRIEVAL, REPRODUCTION, AND RECONSTRUCTION OF DISCOURSE INFORMATION FROM MEMORY

6.10.1. Most of the speculations just made about the processes involved in discourse processing can be empirically assessed in experiments only by evidence based on retrieval and reproduction data. Recent work on recall, recognition, and summarizing of discourse has shown that at least some of the

hypotheses are very plausible, although little insight into the exact processes involved has been gained.[30] The same holds for processes of *retrieval* of discourse information. Analysis of recall protocols allows us to make assumptions about what is stored and how information from discourse is stored, but the detailed processes of retrieval are still very much unknown. Again, we therefore make only a few remarks about the more general principles that might be at work in retrieval and reproduction.

6.10.2.   A first basic principle, formulated earlier in the Gestalt tradition, and reformulated at several times in more recent work on recall, is that recall of information is not only *reproductive* but also or even predominantly *reconstructive*. Depending on the specific tasks, a subject will not simply copy the available information from memory and express this in a protocol, in another discourse or in (inter-)action but will construct or reconstruct information. A first reason for this is that such operations presuppose an economic principle of information storage: If information need not be memorized as such but could be *inferred* from other information during recall, this would save important memory space. Second, reconstruction of information is necessary because of the demands of the future contexts of its use. These contexts will have their own specific properties, with specific goals, constraints, and other factors that determine a *desired* output. If the language user does not know what these future contexts will look like, the information should be stored in a form that allows *multiple applications*. This assumption further explains our finding that macrostructures especially are stored in memory and those especially that are relevant for future cognitive functions. Finally, it should be stressed that reproduction in any kind of verbal form entails the normal rules and constraints of discourse *production* to which we turn later. The two tasks (viz, adequate recall and adequate discourse production) will not always be running parallel. This means that recall protocols will only be indirect evidence about information recalled or retrievable from memory.

It should be added to these remarks that correct reproduction of information from discourse is a task that seldom arises outside the context of the laboratory and some forms of education. When we have to reproduce in a natural communicative context what others told us, what we read in the paper, or what a novel is about, we have only very global constraints on adequate reproduction.

6.10.3.   The second general principle we would like to propose is that retrieval operations depend on the *structure* of the information of discourse representation in EM; that is, the structural value of an item is a valid

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[30]See the references given in footnote 2, p. 203.

indicator for its probability of retrieval. In particular, one could say that the higher the structural value, the higher the probability of retrieval. This means for instance that *macropropositions* in discourse reproduction are the first candidates for retrieval. If the reproduction context aims at a more or less correct expression of what can be retrieved, it follows that in recall experiments first we find a relatively high amount of macropropositions in protocols. This prediction has indeed been confirmed by several experiments.[31]

Besides macrostructures, according to our theory we also find global propositions that have a high structural value due to many links with knowledge or other cognitive systems. In a context which would allow subjects to give their *opinions*, we would therefore find mainly those (macro) propositions which had given rise to extensive evaluations.

The structural account of retrieval processes is based on the assumption that on the one hand retrieval is 'hierarchical,' that it follows information structures from top to bottom along structural connections, and that on the other hand given a high structural value and hence more connecting links the probability that one of the links is found during a searching procedure that leads to a macroproposition is higher than a link leading to a particular microproposition.

Finally, it should be recalled that the reproduction of a large number of macropropositions in memory protocols in recall experiments also depends on the general *production* constraint in natural communication that mainly the *most relevant* information be reported, which again is most often the macrostructure. Even if we would recall details of what was said, these are often simply ignored in production because the hearer may not be interested in them. Even if the context in the laboratory is different, the subjects are not able to abandon fully the normal constraints of discourse (re-)production.

6.10.4.   A third general principle of retrieval is that it is supported by the *knowledge system*; that is, a subject not only will go through the memory representation of the discourse but will, just as in *comprehension*, apply strategies and other operations to find, actively or by recognition, information in EM. As we have seen, this principle is closely linked to that of the *constructive* nature of reproduction. It explains why subjects often reproduce information which was not in the text and which was probably not in the representation either. Especially information that cannot be found by search alone will therefore be constructed, matched by recognition procedures, and then reproduced with more or less confidence. This

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[31]See van Dijk and Kintsch (1975, 1977) and Kintsch and van Dijk (1978) for experimental evidence about the role of macrostructures in recall and other reproduction and reconstruction tasks. Most of the findings briefly mentioned below are drawn from this work.

procedure is followed when the information to be retrieved is part of frame- or script-like knowledge.

The reconstructive nature of retrieval processes may result in different *transformations* of information with respect to input information and/or with respect to discourse representation in EM. We have remarked earlier that some of these transformations already may take place during comprehension. In that case the transformed structures are already part of the representation. Transformation during comprehension in general depends on the various factors of the cognitive set and takes place in the construction of coherent representations, which must be as consistent as possible with our knowledge of the world fragment the discourse refers to. Retrieval transformations may take the following forms:

(a) DELETION. Information is left out because it is assumed that it was not in the original text or because it is thought to be irrelevant for reproduction.

(b) ADDITION. Information is added because it was assumed to be in the original text, because it would make the text more coherent or more 'logical.'

(c) PERMUTATION. The order of information is changed because the original order is assumed to be less coherent or because new ordering is thought to be better understood in reproduction.

(d) SUBSTITUTION. Information units are substituted for other information units also because the new unit is assumed to be more coherent or better understandable.

(e) RECOMBINATION. Information elements are recombined in other units.

(f) LEVEL SHIFT. Information high in the hierarchical representation is downgraded and/or low information is upgraded (e.g., due to new knowledge or other cognitive set factors about the relevance of information).

These transformations in principle allow that the resulting reproduction of a text is different from the information in the text. This was already the case due to the processes involved in comprehension and storage and the structural retrieval constraints. In principle these transformations account for most of the variation in recall protocols, given an assumed text representation in EM.

Note that the transformation of ADDITION may involve *inverse application of macrorules.* Whereas macrorules delete, generalize, and construct away information, the additions may take the following form:

(a) addition of descriptive, irrelevant, detail;
(b) particularization of generalized propositions;

  (c) specification of frame- or script-information:
       -addition of normal conditions,
       - addition of normal components or properties,
       - addition of normal consequences.

To apply these rules, knowledge of the world, viz., of typical situations, likely participants and objects, and the internal structure of frames and scripts must be applied. These various additions account for the frequent 'intrusions' occurring in recall protocols. Part of the intrusions however also are determined by the production constraints (e.g., the establishment of coherence, comprehensibility, and, originality) of the recall text. The same holds in part for all kinds of metacomments *about* the text, the topic, the input or output contexts, and the opinions of the reader with respect to these.

6.10.5. It is a well-known experimental result that recall of information, also from discourse, diminishes after longer *delays*. Whether this is due to processes of decay or due to interference with new information in episodic memory is not a problem to be discussed here. It is interesting only that the process of forgetting easily follows the structural hypotheses made previously. The information that has highest structural value due to either high-level position in the representation (macrostructures) or special links with knowledge and other cognitive systems, will be more resistant to 'forgetting' than other information. So, whereas in immediate recall many details can still be retrieved, some weeks later we find mostly macropropositions in recall protocols.

   A first problem here is that the details that are retained in immediate reproduction may be highly variable across subjects, whereas the macrostructures are recalled by most subjects. Theoretically we can explain this phenomenon only by having recourse to the variable cognitive sets of subjects: They have different motivations (and hence variable attention, which influences the amount recalled) and different interests and opinions. Only if we would be able to specify and control a reasonable part of the systems involved for a group of subjects would we be able to account for such variations. We may expect then that subjects with more knowledge about a subject, more interest for a topic, and specific goals will comprehend better, have a more structured representation, and hence have better recall of a text that would fit these conditions.

6.10.6. Given the theoretical reflections of this chapter we would also be able to explain other kinds of experimental or natural tasks in discourse processing. Most striking for instance have been the results in *summary* experiments. Given theoretical descriptions about the macrostructure of a given discourse, we may expect that the structure of a summary will be a more

or less close expression of this macrostructure, of course under the usual constraints of production processes and personal differences, due to cognitive set. This means that a language user is also able to apply macrorules *consciously* and to isolate the higher-level structures of discourse representations.

6.10.7.   The reproduction of discourse is determined not only by the global content but also by the global forms, viz, by the *superstructural schema* of the discourse. It is a normal tendency in reproduction of discourse types that the schema of the original text is transformed to the canonical schema. This may already happen during discourse comprehension, unless there are specific requirements to memorize schematic information (e.g., in the aesthetic perspective of literary communication).

On the other hand, superstructures may also serve as *retrieval cues* and *production plans*. We may only remember that the discourse was a story or an argumentation and that from there we are able to generate the respective categories. The same holds in production: Instead of reproducing a schema the subject may simply construct a schema for the recalled information. Note also that since it is especially the macrostructure that is recalled and since superstructure categories are filled with macropropositions, recall protocols and summaries usually have a correct schematic structure: They are also stories or have the form of a (short) argument.

6.10.8.   Finally, it should be added here that although we have focused on semantic information processing and although we have argued that primarily macrostructures are recalled, recall of surface structures and semantic details is not impossible. Especially in immediate recall, specific stylistically salient expressions may well be recalled, or at least recognized, and the same holds, as we saw earlier, for semantic details. We may even have long-term memory for general stylistic features of specific types of text and of a specific author, first because this general stylistic knowledge is part of our knowledge of the rules of language and communication, and second because we are also able to memorize purely structural information on the basis of recurrent feature collections, as we also have in visual information processing. We ignore however what the principles are that underlie the specific memory of subjects for surface structure properties of discourse.

6.11. COMPREHENSION AND PROCESSING OF INTERACTION AND SPEECH ACTS

6.11.1.   We may be brief about the processes underlying the comprehension and memory storage of information from interaction and speech acts, because we assume that the semantic principles of complex information

processing for discourse are essentially the same. There are also a number of differences and additional problems that we have to discuss however.[32]

First of course the initial input for information about actions is different. Instead of visual or auditory information in the form of symbolic surface structures, we have perceptual information about doings. We observe sequences of doings of one or more persons (viz, body movements and resulting events in the action context). The same holds for action representations in pictures and movies. Apart from the nature of the input signals themselves, there is the rather important difference that discourse is essentially *linear* and doings both linear-in their sequence-and *parallel*; that is, in many doings bodily movements and results may occur at the same time, and these events must be integrated into one doing event: Somebody entering a bank not only walks but also moves his hands and body such that the door opens; he has a specific posture for his head, etc. Other doings, like driving a car or repairing something, may even be more complex. These complex doings at the same time must be isolated from other doings occurring at the same time but which do not belong to the action proper: The one entering a bank may at the same time smoke a cigarette and adjust his tie. We have seen that doing sequences are abstractions from such complex bodily activities. This abstraction is possible due to the *interpretation* of the doings as coherent action sequences. Since we have to neglect the processing of surface structures in this book we do not further discuss the various processes involved in the perception, abstraction, and interpretation of doings as actions. We simply assume that the perceptual processors compare feature schemata of doings with inform2ation in LTM and thereby assign actions to the doings. This is possible only, of course, on the basis of world knowledge and contextual knowledge about the possible and probable *purposes* and *intentions* of the agent. Comprehending action, then, essentially involves the construction of action concepts of which assumed purposes and intentions are inherent constituents. If we may assume that the purpose of an agent opening the door of the bank is to enter the bank, the doing is not interpreted for instance as 'trying the door,' which would be possible in a situation where a repairman would open the door again after damage or breakdown.

Another problem at this surface level is the *segmentation* of activities. Similar problems exist, in verbal communication, in the segmentation of phonetic strings. In that case it is the 'underlying' phonological and especially the morphological analysis that assigns the segmentation, given knowledge about the conventional meaningful units of the language. We may assume that something similar happens in the analysis of activities: Doing units are isolated on the basis of abstract doings that may be interpreted as actions.

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[32]See Schmidt (1976) and Wurtz (1978).

Walking to the door, opening the door, and entering a house would for thus instance be such units. Social conventions and cognitive relevance would thus determine that stretching your hand toward the door knob would only be such a unit under specific circumstances.

6.11.2. After this doing analysis, the processing model for action comprehension would first construct a *conceptual action structure* in STM. We simplify matters considerably by assuming that this conceptual structure is of a propositional kind and therefore neglect the possibility that also visual information is coded after initial processing. Hence, when we see somebody entering a bank, we simply construct a complex proposition or FACT (viz., '*a* is entering the bank') according to the appropriate FACT schema in which the action, the participant, possible properties of the participant, time, place, etc., are represented. Just like a sentence a complex doing hence is analyzed in atomic propositions that are organized in FACTS. The FACT is indeed the perceptual and cognitive organization of 'what is happening' (e.g., an action).

Our discussion should however focus on more complex actions in *action sequences.* The one entering the bank walks to a counter, takes a check, signs it, gives it to the person at the counter, etc. We see in Chapter 4 what the conditions are for this kind of sequence to be connected and coherent ' Essentially each action should be a condition for a next action to be successful; the same participant(s) must be involved; and a sequential or global result or goal must be represented by the agent. Understanding the action sequence involves the formation of hypotheses about these connections and about sequential results and goals as represented by the agent. The coagent or observer therefore represents the mental states and events of the observed agent as part of the action concept structure. As long as the doings and individual actions are in accordance with assumed purposes and intentions, the action sequence is understood as being *meaningful*. Further interpretation would involve the construction of hypotheses about the possible *motivations* of the agent (e.g., wanting to have money in order to buy something).

We assume that the processing constraints in STM also apply for action interpretation: The STM buffer has limited capacity and therefore only some action FACTS can be stored there, to assign connections between subsequent actions (e.g., entering a bank and going to a counter). These connections are as usual established on the basis of world *knowledge*, in particular, knowledge about social frames and scripts. Otherwise we would not know whether the sequence of going to a counter and taking a check and signing it is meaningfully connected or going to a counter and placing ones shoe on the counter is not.

We have seen that the interpretation of action sequences next needs the assignment of *global actions* to action sequences. We must know what is

going on also at a more global level of analysis: The actions mentioned before make sense also because as a whole they represent the global action of taking the money from the bank. This global interpretation is possible because the observer can apply macrorules on the action sequence, thereby deleting irrelevant actions, generalizing others, and constructing preparatory, component, and consequence actions as global actions. Again frame and script knowledge, knowledge about the possible relevance of individual actions, etc., is necessary to construct this kind of macrostructure. We assume then that, when observing real or represented action sequences, a global action concept (viz., a MACROFACT) is kept in store in the STM buffer, until a new MACROFACT becomes necessary to subsume next action subsequences. By a cyclical process, then, the information is stored in EM, where a representation of the action sequence is constructed. Specific interpretation by the cognitive set factors is also involved during observation and storage, so that special opinions about the action sequence can be stored. Details need not be given here about this memory representation in EM, because it is roughly of an identical form to the information discourse.

6.11.3.   Some remarks about further specifics of action comprehension are in order though. First, a discourse merely expresses an incomplete picture of reality: Only what may be communicatively relevant is expressed, and many connecting propositions need not be expressed due to shared knowledge of language users. Something similar may be the case in *represented* actions in pictures, strips, or movies, but in natural (real) action understanding the observer has the full complexity of the activities involved. This means for instance that the abstraction and selection process of the very doings is already more complex than in discourse understanding. Second, rules and strategies must be applied to isolate the actions that are relevant for further processing. On the other hand the knowledge system is called upon less to establish coherence by missing links, since the action sequence is *continuous*. But in general it may be assumed that the amount of information to be processed in the observation and interpretation of action is much greater than in discourse processing, where this processing has already been 'prestructured' by the discourse/author/speaker.

Note also that the actual observation of action always takes place at the *local* level. The doings at that level must first be interpreted as actions, and these actions may be abstracted from by the macrorules so that global actions are assigned. From the sequence (going to the bank, entering the bank, ...) we construct 'taking money from the bank,' which may be a normal condition for the higher-level action of buying a car which in turn may be part of still higher (interaction) structures. The lower-level actions often only make sense given the more general interpretation. This also holds for action

connections and coherence in sequences. Thus, contrary to the interpretation of discourse, we do not seem to have anything like 'topical sentences' that directly express the global meaning. In fact, global structures of action are often described only through language (viz, by action descriptions).

6.11.4.   There is another point where global discourse and global action processing may differ. Recall that discourse in general should satisfy elementary constraints of pragmatic communication. For instance we inform people, promise something, or make requests. In many cases such speech acts accomplished by the utterance of discourse in the appropriate context should be relevant for the establishment of conditions for further cognitive and interactional activities of the hearer; he will acquire knowledge for instance. This means, as we have seen earlier, that a discourse in general only expresses the pragmatically relevant information (viz, the information that is thought by the speaker to be relevant for the hearer). Of course, this is a general and more or less ideal constraint: In actual discourse, as in everyday conversation, there are many examples of information that do not have this kind of pragmatic relevance. Again, we see that in discourse there must be a selection of *possible* information that might be given about the world.

   In action and action observation however this relevance is not immediately given but must be interpreted by agent and observer, e.g., with respect to global actions and further interaction. This means that many of the observed actions of everyday life merely have strictly local significance. They neither are part of important global actions nor are they crucial conditions for future interaction that is important. The cognitive consequence for further processing is obvious: It makes no sense to store this information in *memory* such that it can easily be retrieved. In other words, such action information is simply stored, low level, in EM as long as there are no macroactions applied to them or no other kinds of relevance connect them with other actions, knowledge, or items from the cognitive set systems. Discourse, and in particular action description and stories, in fact is about the more interesting and relevant actions only, and therefore in principle it is better organized and stored in memory. Normal (inter-)action is so often according to frame and script that the individual instances need not be stored for effective retrieval: There is very little reason to know later whether I took one or two cups of coffee this morning or whether I went to the bank by car or by bike. So only the higher-level actions, which are either important for later action (e.g., buying a house) or the more interesting lower-level actions (like finding a wallet with 10,000 dollars) need be specifically recorded, for later storytelling or other action accounts.

6.11.5.   The global comprehension of *speech acts* combines of course features from both global discourse and global action comprehension. First

this means that the respective sentences of the discourse of one speaker should be interpreted relative to the previous sentences of a previous turn in a conversation, then with respect to sentences of other speaker, and then with respect to the speech acts being accomplished in the sequence; that is, the global relevance of sentences in conversation should be determined not only by semantic macrorules but also by *pragmatic* macrorules. This may mean for instance that a proposition is not directly relevant for the interpretation of another proposition but rather the accomplishment of the speech act -by uttering the sentence expressing that proposition- may be a pragmatic *condition*, for another speech act- accomplished by the utterance of another sentence. Of course, within one turn of one speaker and within one global speech act, the global coherence may well be operating especially at the semantic level. Whether in monologue or in dialogue, however, the hearer/reader should in principle keep track both of the semantic information from the discourse and the conceptual information from the respective speech acts performed by the utterance of the discourse (e.g., in subsequent turns). Theoretically, this is not at all easy to model in the comprehension theory, because until now we have only met 'single-track' semantic comprehension processes, even if this might take place at several (micro- and macro-) levels. This complexity is however still greater when we realize that to assign the correct speech act to an utterance, the hearer must at the same time have made an analysis of the *context*. Without such an analysis he cannot judge which contextual features are available to know what speech act is accomplished and /or whether a given speech act is appropriate in that context. A detailed account of the various processes of speech act comprehension would carry us too far here, so we mainly give the major features of that process, which, as a matter of fact, is still hardly investigated experimentally or theoretically.[33]

The assignment of speech acts to utterances of course basically resembles the assignment of actions to overt doings. The difference lies in the fact that the 'doing' which is the utterance is itself a highly complex symbolic (semiotic) unit which requires interpretation on its own. To know what speech act is being accomplished by a speaker, a hearer thus must make two analyses, one of the text and one of the context, and match them. How pragmatic contexts are analyzed we can only guess at the moment. First, we must assume that the *social context* in which the communicative event takes place is analyzed for relevant pragmatic features. This process probably is not a passive process of scanning, matching, and recognition, but at least it also has a *constructive* aspect; that is, language users already *know* what kind of features are likely to play a role, and they might therefore have a *schema* with the appropriate

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[33]For theoretical accounts of pragmatic comprehension, see van Dijk (1 977c, 1978a).

categories with which the contextual features may be captured and combined. In Chapter 5 we see what kind of features are involved here; various cognitive states of the speaker such as knowledge, beliefs, wants, intentions, and evaluations; next occurs a number of social relations between speaker and hearer such as social frames, roles, and dominance. It may be assumed that the schematic analysis of the social context by which the pragmatic context is constructed has a hierarchical nature: The reader will know or infer what global social system, subsystem, and frame are involved (e.g., public, traffic, street); then, if possible he will identify and categorize the participants, in particular the speaker (e.g., policeman). With this knowledge he knows the possible actions and also the rights, duties, etc., of both the speaker participant and himself. Within this general analysis, the *particular* facts must be analyzed (e.g., the fact that in this context he made a mistake in his traffic behaviour); with respect to that action, he may expect certain actions of other participants to be possible or even necessary (e.g., by a policeman). This analysis takes place in STM along the lines of the comprehension processes sketched previously: interpretations of actions, actualization of frame and script knowledge, formation of global concepts of the situation (e.g., make a wrong turn, speeding), etc.

It is within the framework of this complex analysis, and with respect to the context representation in EM, that a participant hearer is confronted with a speaking action of another participant (e.g., our policeman). After several steps of local analysis, such as being sure that the utterance is addressed to him, the hearer will start the semantic interpretation of the utterance, according to the processes briefly sketched earlier. In the meantime, it should be recalled, the hearer has a rather complex representation of the situation, including possible actions of participants, which may include possible speech acts and therefore also expectations about possible topics. In our example this may even be obvious: The policeman will talk about the traffic mistake I made. In other words, it is sometimes the case that the social context already allows a hypothesis of the global speech act being performed by a speaker participant and therefore also about the global content. We may assume that in such cases the hearer has this information stored in the STM buffer. The local analysis of the utterance then checks whether the global topic can be confirmed or another will be constructed.

Similarly, the STM buffer may already contain the concept of a global speech act in certain clear contexts. In that case the sentences after semantic interpretation receive a pragmatic interpretation and the subsequent speech acts can then be (macro-)interpreted with respect to the global speech act. If not, this global speech act must be constructed on the basis of the subsequent local speech act (viz., according to the rules and principles of Chapter 5 and this chapter), that is, for each speech act it must be determined what its role in the sequence may be. Within the schematic structure of everyday

conversation or in other prototypical frames such an analysis may be relatively straightforward, given the ritual nature of those speech acts (e.g., greetings at the beginning and end). Then it may become clear that a sequence of speech acts establishes conditions for the accomplishment of another speech act (e.g., a request) or the accomplishment of a global speech act (e.g., a complaint). As soon as the hearer has a hypothesis about the global speech act now being carried out, he stores the global concept in the STM buffer. This means that in addition to the information units we have there now (viz., at least two FACTS, one or two MACROFACTS, schematic information, and information from knowledge and/ or elements of other cognitive sets) we now find an additional number of information units (viz., the actual speech act and the actual global speech act). Unless pragmatic interpretation takes place *after* semantic interpretation (and storage in EM), which is unlikely given the close interdependence at the local level of semantic and pragmatic interpretation, we now have at least seven information units in the buffer, which is theoretically possible. In that case the storage problem however would be that there is probably no place in the buffer for all kinds of contextual information that is necessary for the speech act assignment. A possible solution for that problem is to assume in the model that EM plays a more active role in local, short-term storage and reinstatement of all kinds of conceptual information.

Before global interpretation of speech act sequences is possible in the way just sketched, we still need the proper identification of sentence utterances as certain speech acts. This means that the contextual analysis must be matched with the *utterance analysis.* Note that this utterance analysis involves not only surface analysis and semantic interpretation but also analysis of all kinds of phonetic and paraverbal features: pitch, intonation, loudness, speed, and the gestures, movements, facial expressions, etc., of the speaker. The data of the context analysis and of the utterance analysis now in expedient *strategies* are combined to construct the necessary conditions that construct or allow the inference of the accomplishment of a given speech act. The semantics indicates what events or actions, by speaker and /or hearer, are involved at which time; syntax roughly indicates differences among indicative, interrogative, or imperative sentence forms, so that global speech act classes are indicated, the paraverbal features indicate the possible states of mind of the speaker (anger, impatience, needs, etc.) that for instance differentiate a promise and a threat. The context knowledge provides the hearer with information about previous (speech) actions of himself and other participants and with the necessary features collected by the pragmatic schema from the social context. This allows the inference about the possibility or plausibility of a statement, request, order, threat, or promise. Important in this whole process are correct assumptions by the hearer about the relevant mental states of the speaker. These must be inferred from previous knowledge about the

speaker, previous actions, speech acts, and from the paraverbal behaviour of the speaker.

It hardly needs to be repeated that what goes on here is of extreme cognitive complexity: Many kinds of data come in at the same time; social knowledge, pragmatic knowledge, and language knowledge must be searched, actualized and applied to the data; and interpreted data must be connected, globally interpreted, arranged in schematic structures, and stored, etc. A detailed process model about the order and dependencies involved, therefore, cannot be given at the moment.

Whatever the precise details of the process model are, however, it is also clear that the very high complexity of the information processing that takes place cannot possibly be handled without the operation of macrostructures at the various levels. The hearer knows globally what social context and frame is relevant; he knows globally what action or interaction is being carried out (e.g., getting a ticket by a policeman); he knows globally what the topic of the subsequent sentences of the speaker is; he knows what the global speech act is that is performed by the utterance of these sentences and also what the function of this global speech act is within the overall interaction; and for all these levels he also knows which conventional schemata organize the global FACTS. The global interpretation allows the hearer to link the various levels of data analysis also in a global way, without necessarily matching the respective local or microdata of each level with each other. Similarly, the global units monitor the interpretation of the microdata, establish necessary connections and coherence, and at the same time provide the necessary structure to the complex data structure in EM so that reinstatement of data and further processing becomes possible.

6.11.6.   After these assumptions about the comprehension of speech acts and the global assignment of macrospeech acts to speech act sequences, we finally offer some remarks about *memory storage* of this kind of information.

For speech acts we may repeat the remark just made about the local' relevance of actions. In general we hardly need to remember for further use of the individual speech acts (e.g., in everyday conversation) of speakers. These speech acts may have as their unique function the local coordination of action: To ask for the butter, greet somebody in the street, give advice about the wine in the restaurant, etc., are relevant only in immediate, local interaction sequences. This means that the pragmatic information need only be accessible during a short time, and in general it is impossible to remember much later what speech acts were involved. So, only those speech acts which have long-range relevance for future interaction (e.g., promises) or which in other ways have specific relevance given the expectations determined by the cognitive set (e.g., threats) are stored in such a way that later retrieval for action or verbal account (stories) is possible. If possible, such speech acts are

mapped on a macrostructural level, so that not the individual speech acts but rather the overall speech act is remembered: 'Peter asked me for some money,' 'He threatened to fire me.' Sometimes this overall recall for speech acts is combined with the specific text type: 'He gave a lecture,' 'He told a story,' 'We argued about. ...' It should be stressed however that even this storage of global speech acts is often relevant only for accounts about 'what happened.' More permanent information that forms knowledge, opinions, and attitudes is often not pragmatic but rather semantic (i.e., pertaining to the 'content' of the speech acts): It is the information itself which is conveyed by a statement which is important for later use, and in such a case we often have abstracted from the *episodic* aspect of the particular local or even global speech act performed. We therefore must assume that although for a particular discourse or conversation the global speech act has an important hierarchical position in the episodic representation of the communicative event, the lack of many systematic links with knowledge and other elements of the cognitive set prevent long-delay recall of (global) speech acts. Exceptions are those speech acts that clearly go beyond the relevance in the actual context, such as long-term promises, general commands, or crucial threats. In that case, many future (inter-)actions and their plans have to integrate memory for such global past speech acts. Further research would be necessary to investigate in what respect memory for actions and events differs from memory of (verbal) information. Since both are 'translated' into semantic conceptual structures, there should be no a priori difference, but the different functions of verbal information and actions would nevertheless warrant a more detailed comparative analysis. Although we have seen that macrostructures are crucially important in the comprehension and storage of all kinds of complex information, the functions or relevance of information in knowledge formation and the change of cognitive set, and in the future (inter-)actions of the individual need to be accounted for in the other terms. Hence, the role of macrostructures should especially be sought in their functions inprocessing of complex information: comprehension, storage, and retrieval. The role of the information itself should be determined in terms that go beyond its global organization by macrostructures.

6.12. PLANNING AND EXECUTING COMPLEX (INTER-)ACTION

6.12.1. Until now we have focused on the role of macrostructures in processes of interpretation/comprehension, storage, and retrieval of both discourse and action information. Macrostructures however also play an important role in the various processes of *production* and *execution* of discourse and (inter-)action. In other words, instead of looking at the

cognition of hearers and observers, we should also look at what goes on in *agents* and *speakers*. We first briefly investigate the productive phases of action and next the further analysis of discourse production. Although both in the cognitive theory of action and in that of language processing little is known about production processes, we again have to abstract from the details at the local level. This means for instance that we ignore the important current work about sentence production and focus attention on the planning and execution of global semantic and pragmatic structures of *sequences*.

6.12.2. We distinguish three *phases* in the production of complex action sequences.[34] The first phase involves a number of mental states and operations, such as needs, wishes, preferences, and decisions, which we have already determined under the global notion of *motivation*. The motivation includes the initial 'causes' of actions (viz., their *reasons*). The second phase is the actual mental 'preparation' of particular actions and includes the formation of purposes and intentions, which we earlier called the *design* of action. It is in this phase that we construct macrostructures of actions that are commonly known under the notion of *plans*. The third phase comprises the actual *execution* and *control* of the action in the form of doings and activities. We show in the following that in the same way as global action concepts control the comprehension and storage of action sequences, global plans control the execution of action sequences.

6.12.3. We are only able to summarize some of the 'underlying' *motivational* properties of action production. Although action plans are based on highly complex processes and although in motivational and decisional structures global information processing may also be involved (see subsection 6.12.7), an underlying cognitive analysis does not belong to the tasks of this book. Hence, we only enumerate some of the factors involved in these initial phases of action production:

(a) biophysiological needs;
(b) the cognitive interpretation of these needs ('sleep,' etc.);
(c) the social context of (a) and (c): social needs; norms;

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[34]We are indebted here first to the classical work done on action and plans by Miller, Galanter, and Pribram (1960). It might be added at this point that our earlier work on macrostructures of discourse (van Dijk, 1972), which had to proceed without serious linguistic models of global interpretation, found much confirmation in this book for some of the basic hypotheses involved in particular for discourse, this also holds for Bartlett (1932), which also was the major inspiration source for much current work on discourse comprehension and the role or schemata or frames/scripts in psychology and artificial intelligence.

For a detailed analysis of the various phases of (inter-)action, as well as many examples, see especially Rehbein (1977), of which the results could not yet fully be integrated into our model.

(d) specific desires, wishes, wants;

(e) knowledge about possible/realizable states of affairs and about possible courses of events and actions, own abilities, actual context, etc.;

(f) preference calculation of a specific event, state, or action.

It is still unknown what the precise cognitive processes and strategies are that link these respective stages of action preparation, so we don't try to analyze them here.

6.12.4. In action descriptions the various properties of the underlying motivational structures may be expressed in the *explanations* we give about the actions of others and ourselves: We eat a hamburger because we are hungry; we buy a car because we need and want one; etc. Yet, actions are not consequences of the various motivations just discussed. First, wanted states or events may not be attainable by actions at all, such as winning in a lottery or being promoted: They may depend on chance, physical or other courses of events, or the actions of others. In such a case we may only hope or expect that the wanted states or events will be realized or accomplished actions which *may* lead to events or actions by others that will realize the wanted states or events.

On the other hand, one way of realizing our wants is the accomplishment of action, so wants may give rise to the 'formation' of the idea to realize the wanted state by an action: We *decide* to do something.[35] Yet, such a decision is still rather general, because there may be many actions that may lead to the wanted state or event. So, again a complex *decision procedure* is necessary to know what action would be 'best.' The ideal criterion involved would be a calculation of the *optimal* action: the action with a maximum of wanted results or consequences and a minimum of 'costs.' Such a decision procedure of course also draws upon world knowledge about the possible consequences of actions, our own capacities and abilities, knowledge about the conditions in a particular action situation, and so on. The conclusion of this procedure, then, will be a particular action, conceptually represented as a *possible* (optimal) condition for the realization of a wanted state or event.

Only on the basis of this decision is it possible to prepare the *actual action*; that is, decisions as such do not yet determine when, where, or how the action

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[35]Decision procedures are analyzed in more detail in philosophy (e.g., Rescher, 1967), in theories of business administration and artificial intelligence (e.g., Newell & Simon, 1972; Simon, 1947), and in social psychology (e.g., Festinger, 1964). Clearly, all the relevant results of this and other work cannot possibly be reviewed here. For underlying preferences, see Rescher (1968); for another abstract analysis of motivations, see Nowakowska (1973). A survey of psychological aspects can be obtained in the reader of Bindra and Stewart (1971).

is to be performed: It is merely the representation of an action concept within a complex representation of a situation, with other actions, possible consequences, and so on, plus a representation of the fact that such an action is preferred over other possible actions.

From now on, the agent may start the *design* for the proper action. A first main component for such a design is the specified representation of the state or event that must be realized by the action. This is often the content of the underlying wants or preferences but it need not be: It may be that only a part of a wanted state can be realized by the action. It is this state or event which may be the consequence of the action which we normally call the *goal* of the action. The cognitive representation of it has been called the *purpose* or *aim* of the action. Note that the goal is merely a *consequence* of the decided action, and this consequence may well not be under the control of the agent. Finally, the agent will effectively form the *intention* to carry out a particular action. We simply take the intention of an action as the cognitive representation of an action concept together with the representation of the actual doing at a certain moment. In Chapter 4 we summarized some of the cognitive properties that must be involved in the purpose and intention of actions (e.g., awareness and possible control).

Both empirically and theoretically it is not fully clear whether we should still postulate cognitive processes or representations between intentions and the actual bodily execution of actions. Intuitively, we say that we may have the intention to do something but that, due to circumstances, we may *change* our intention and *decide* to do something else. This means that there is still a specific point where it is decided to *now* start the execution of the action, after which the necessary signals are given to the sensorimotoric execution program coordinating the doing at the lower level, which is not discussed here. Hence we have at least three points where decisions are made: a decision to do something, a decision to perform a particular action, and a decision to perform an intended action now. We may imagine that decisions are mental representations that control sequences of following activities: They determine what direction certain thought processes or motor processes much take.

Finally, given an intention of an action and the decision to execute it, the action is actually carried out by the performance of a doing (viz., a coordinated sequence of bodily movements). We have seen earlier that most of the doings take place at several levels and in a complex sequence: Entering a bank is such a doing, which may even be analyzed into more elementary actions/ doings. We assume that the intention of the action is the effective *control mechanism* during the execution for the action, because here the agent may permanently match the phases of the (represented) ongoing doing with the representation of the action. We have seen that the representation of the final state of the action (viz., of the *result*) belongs to the intention and that

therefore the control over the doing may check whether the result will or Can be reached. Changes in the way the action is carried out may be necessary to realize the result. Once the result is realized, the signal may be given that the doing is to be stopped, because the representation of the observed state of the world is identical or similar to the representation of the result in the intention. After that, events or other actions are expected to occur which are themselves the goal of the action or which have the goal as their own final state or even consequence (when indirect goals are involved). Details about the precise cognitive control processes during the execution of doings are ignored here; they are still largely unknown for that matter.

6.12.5.   It is not superfluous at this point to stress that our sketch about the underlying structures of cognitive action formation is highly abstract. The actual execution of actions do not always take place after the whole sequence of processes has been gone through: We act 'without thinking,' 'by impulse,' etc; that is, parts of the intermediary sequences may be skipped: No extensive analysis of the situation is made; consequences are not well-represented; abilities are not well-analyzed, preferences not calculated, etc. In general it may be clear that all these processes need not, and mostly are not 'conscious,' in the sense that we could exactly express them in a protocol. Large portions of the basic needs, general knowledge, values, or attitudes that determine the decision process are not accessible in an explicit way during decision making, design, and execution. Only in higher-level, complex actions, it may be possible that at least part of the steps in a decision process is consciously controlled (as 'mental acts') and expressible. Such expressions often take the form of an *argumentation*: initial data, arguments pro and con certain actions, general principles governing actions and courses of events, etc., and finally the conclusion that represents the decision of the practical argument. Empirical research is necessary about the respective stages of action formation, the interdependence of the various cognitive factors of the cognitive set involved, and control over doings.

6.12.6.   Even at the level of rather elementary actions we have seen that a very complex cognitive process is involved. Of course, as we saw, much of this does not occur under conscious control or only semiconsciously. Many of the doings have been executed so often that the whole process has been automatized in cognitive *routines*. Such routines especially are relevant in the control of doings. That means that we may have the intentional checks of the phases and success of the doings be carried out by a fixed *program*, which needs only marginal cognitive attention. Hence, during the execution of routine actions other cognitive processes may be under focus: We may drive a car and at the same moment talk with somebody. In other words, structures of

intention and processes of control may be organized in schematic programs which carry out the analysis of incoming information about the doing and which sends signals to the execution operators.

This programming takes place not only at the lower level of routine actions and doings but also is necessary for the formation and execution of complex *sequences of action.* It is at this point that macrostructures in action production play a role; that is, if we want to execute a sequence of actions, we do not simply intend to execute a first action, then intend to execute a second action given the results and final circumstances of the previous action, and so on. This kind of *local* control of action sequences would make the successful execution of *unified or coherent sequences* impossible. First, it is necessary to have a permanent representation of the final *sequential result.* Without this result it is not possible to decide at each point in the sequence which next action would be the most optimal one. We would only haphazardly accomplish actions or else be obliged to analyze and decide again what result we wanted to realize by the sequence. Hence, besides the local formation of intentions about individual actions of the sequence, we need a global representation of the result of the sequence as a whole; that is, we need a macrostructural level of representation of intention. Such macrostructural representations of actions are called *plans.* The intentions to go to New York, to eat in a restaurant, or to work in the garden this afternoon, therefore, are plans. They are intentions of global actions that are executed by the execution of a sequence of lower-level actions. Just like a lower-level intention, a plan *controls* the execution of the sequence: It analyzes whether the individual actions have results that will probably lead to the result of the sequence as a whole. Cognitively this means that in the short-term representation of an action we at the same time have a macrorepresentation of the global action now being carried out, in a way similar to that described previously for the global comprehension of discourse and action.

During the execution of an action sequence the results of the component actions may be such that the attainment of the sequential result is no longer possible. In that case the agent must *change* his plan and decide to execute another global action instead. This is even likely in all those action contexts where the action conditions cannot be controlled by the agent (e.g., in most forms of *interaction*). Since we do not know before what will happen or how somebody else will act, we have only approximate assumptions about the actual possibilities to reach a certain result.

These are also the reasons why a plan in general will not contain the respective local (inter-)actions of a sequence but will consist only of one or more levels of more or less global actions and results. In our plan to travel to New York we shall not yet represent where we shall sit in the plane, to whom we shall speak, etc., first because we simply do not yet have the information to decide upon such local actions and second because decision at such a

'distance' is in general not relevant. At most we may globally decide, and insert into the plan, which airline we shall fly, whether we shall take the car or a bus to the airport, and what time of the day we shall fly.

Only just before the necessary actions do we translate the global parts of the plan into actual subplans and these subplans into actual intentions. This specification of actions consists of processes which are presumably similar to the *inverse macrorules* which we have met previously. Given knowledge about frames, scripts, and courses of events and actions and their likely outcomes in general, we shall plan strategically the *preparatory* actions and the *component* actions of a global action (e.g., go to the airport as a first component in taking a plane and, at a still lower level, go to one's car as a first component in going to the airport). For each sequence at each level we therefore must have the cognitive global representation in the form of a (sub-) plan in order to execute the sequence adequately. The sequence will only be meaningfully connected and coherent under the control of that plan. Besides the execution of normal preparations and components of script-based global actions, we shall *particularize* global actions (e.g., read a book as a particular instance of 'enjoying oneself' during the flight). Similarly we may execute a number of actions that as such do not condition the success of the global action; these are *locally* intended (e.g., taking a beer when thirsty) and are based on incidental or more general needs and wishes that are independent of the global action carried out.

6.12.7. Global plans of action, with global results and controlling the execution of lower-level action sequences, are necessary also because they are part of more embracing *global purposes* or *aims*; that is, many of the states or events we would like to realize can only be realized by a sequence of (inter-) actions. If we want to be in New York, there is no single elementary action we can carry out to realize this state; we must engage in a complex sequence of actions involved in transport.

Given such represented goals, the formation of action designs necessarily must take place at a global level: We must decide which global action will have a result such that a wanted goal can be realized: taking a plane, taking a car, or taking a boat or walk, depending on distance, transport facilities, money, etc. A global purpose, then, is a representation of a (global) goal that one wants to realize by the accomplishment of a global action that was decided to be the 'best' action to be taken among a series of alternatives.

We see that the whole underlying process of motivations also takes place at several levels: We may, locally, want a beer and order and drink a beer; but, at a more global level of needs and wishes, we may want to see a friend in New York and want to go there. So, each action at each level may be associated with its own level 'global' motivations and global purposes and be executed under the control of a global plan. As in discourse and action comprehension

and their higher-level further 'interpretations,' we here witness the inverse *hierarchical structure*: From general needs, wishes, wants, preferences, etc., we derive more particular ones, and similarly for global purposes and plans. This means that at a very high level of action (viz., at the level of general tendencies of our behaviour) general needs and wants may globally control the formation of individual global purposes and plans. If we like travelling, this will control our decision procedures of making concrete trips. If we like drinking, it will at many points decide locally whether we will take a drink or not, even if at that same local level it may sometimes be decided for local reasons that the general needs or wants should not be particularized and satisfied in a concrete situation. Both in the interpretation of actions of others and in the planning of our own actions, such overall *macromotivations* (designs for living, life-styles, life themes, etc.) are very important in the cognitive strategies determining everyday behaviour because they provide a permanent major argument in the complex decision procedures determining actual plans. At the same time they *organize* our knowledge about the global tendencies of actions of others and ourselves, by assigning *global coherence* in their *reasons*: Given certain action sequences, we know in general *why* we do them. In interaction this is crucial for the construction of global *expectations* about the behaviour of others, without which we would be unable to decide upon and plan our own future (re-)actions. In the interpretation of action discourse (e.g., *stories*) such general knowledge about the macromotivations of participants in interactions in particular social contexts provides us with the necessary macrohypotheses about the topics of the discourse (e.g., the global actions that probably will be carried out by the persons described).[36]

6.12.8.   The principles sketched here for the global organization of action production also hold for the global planning of *speech acts*. Again, however, speech acts are a particularly difficult example of (inter-)action because both global sequences of actions must be planned *and* the global content of the monologue or dialogue discourse to be expressed. In conversation this planning, as shown in Chapter 5 in more detail, can only take place at a rather global level, because we do not know the possible speech acts of our speech partners. The construction of a plan for a speech act sequence will approximately be the converse of the comprehension of global speech acts as discussed previously: A global goal is represented in a purpose and a global decision to reach the goal by a global speech act (e.g., a request). At the moment of execution, however, the normal local conditions of appropriate interaction and speech acts must be followed, so the individual speech acts are both under the global control of the speech plan and under the control of the

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[36]See especially Schank and Abelson (1977) for an analysis of these links between macromotivations (life themes) and the comprehension of represented actions in stories.

local interaction context. Strategies are necessary to accomplish successfully both the global action (viz., the request) and the local speech acts: greetings, giving answers to questions, being polite, and so on. In many situations results of the preparatory actions carried out may be such that it no longer makes sense to continue to carry out the global plan, so that the plan can be abandoned and changed.

It should be noted here that both for conversation and for (inter-)action in general there may well not be specific or well-defined (global) goals and hence no specific results, e.g., in the form of a sequential final state wanted or desired by the agent(s). Going for a walk, taking a vacation, and having a normal, nonguided, conversation are examples of actions that are carried out because they *as such* satisfy certain elementary needs or wishes. This means that they need not be goal-directed and that control by a global plan is different from the plans embedded in directed purposes. Although there is certainly a global representation of the (global) action-otherwise the participants would not know what is going on and would start doing all kinds of other things-it need not be planned in the same way as result directed actions are. The control may be exerted in such cases upon the way the global action is carried out, such that for example a state of pleasure is maintained.

Note that the execution of global actions, as also in conversations, meetings, or court trials, is controlled not only by (semantic) macrostructures of plans but also by a *schematic organization* of these macrostructures. These are important because they define the actual *ordering* of the global actions (or subplans), the *categorization* of the action sequences to be carried out, and the hierarchical structuring of these categories. Due to our knowledge of the schematic superstructure of conversations, we know that we must *start* with a section of *greetings* and *end* the interaction sequence in a similar way. The same holds for other conventionalized, institutionalized, and ritualized actions: The schema provides a convenient control framework in the plan giving further structure to the macroactions being planned and determining which possible orderings and hence executions would be acceptable or effective.

If we want to perform a global request and if we do not know for sure whether the various conditions of the request are satisfied, we must build subplans to acquire knowledge about these conditions (viz., by a sequence of questions). The same holds for the performance of the actual components of the request and the normal consequences: making arrangements, thanking, etc. The control of a macrospeech act and conversation schema in the overall speech plan, constantly checked and possibly modified, is necessary to perform this interactionally difficult speech act sequence.

In addition, we have to plan and perform. complex locutionary acts (viz., produce sequences of sentences and discourse) to which we turn next.

6.13. DISCOURSE PRODUCTION

6.13.1. Although there has been much attention in the last few years for discourse processing, this attention has mostly been directed toward comprehension and not toward processes of *production*. Something similar has been the case in the psycholinguistic studies of sentence processing.[37] One of the reasons for this situation is certainly the difference in the nature of the 'initial' data: Once *given* a sentence or discourse, we can test all kinds of comprehension, storage, paraphrase, and memory behaviour. On the other hand, in production, the 'initial' data are undefined, vague, nonspecific things like 'ideas' or 'wants,' which eventually via more specific semantic structures might be *expressed* by words, sentences, and discourse. As soon as we do not 'simply' want to study surface structure production, viz., the *formulation* of syntactically ordered morphemes and their phonological/phonetic realization but rather the various processes in the formation of semantic structures, there are serious experimental problems. Of course we can speculate about such processes, analyze protocols, record introspection, and build semantic production models, but testing these is different from testing comprehension models. In this final section treating discourse and discourse processing, lack of data forces us to limit ourselves to a few remarks that are between reasoned speculation and informal theory formation.

6.13.2. One of the most powerful heuristic strategies in this area is the assumption that the basic principles of productive complex information processing are not fundamentally different from those operating in comprehension. We have seen that this also yielded a plausible sketch for action production.

It should be stressed from the outset that the actual 'execution' of discourse utterances is possible only by the utterance of subsequent sentences. It is assumed that the fundamental principles of syntactic and morphological formulation, lexical choice, and some aspects of style are operative at the level of the sentence. Although interesting, also for a theory of discourse, this 'local' processing cannot be discussed here: It does not belong to the theme of this book. It is also assumed that the sentence formulator receives its information from a conceptual representation (e.g., a complex proposition or FACT). Here semantic relations or functions must be translated into elementary syntactic relations, functions, and word order, and concepts must be assigned adequate lexical expressions. Note that this process is not independent of *textual* structure nor of *contextual* constraints. First, the syntactic structure depends on the topic-comments structure, which as we saw before is determined by the processes of semantic information

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[37]See, however, the work reported in Rosenberg (1977).

distribution in sequences of sentences. The same holds for semantic contrastive stress, presuppositions, connectives, subordinate-superordinate sentence structures, sentence boundary establishment, intonation, etc. In brief, syntactic and morphophonological *planning* also includes information from previous and/or following sentences. Second, this surface structure formation must depend on context, due to the *pragmatic* factors of the speech act being performed, which requires syntactic sentence forms, particle selection, word order, intonation, and so on. Similarly, the essential constraints on lexical selection involve stylistic factors, which depend on both *cognitive* and *social* criteria: state of mind of speaker and the characteristics of the social frame of the speech act. It need hardly be said that sentence formulation further is basically determined by purely cognitive constraints at the processing level: limitations of the STM buffer and hence constraints on length and complexity, more superficially limitations of the surface structure buffer, and other more specific properties of sentence processing discovered in the last few years. We would only like to conclude from this that sentence formation cannot be studied independently from textual and contextual factors.

6.13.3. In *semantic production* processes first we should assume that semantic representations are not usually formed individually, stored in the STM buffer, and then given to the sentence formulator. Given the constraints on coherence, we must assume that also in production processes a sentence meaning can be formed only relative to the meaning of the previously produced sentence; that is, just as in comprehension, the speaker must have available in the STM buffer the semantic representation of the previous sentence. With respect to that FACT the speaker can appropriately determine the connection with a next FACT to be expressed, coherence relations of other kinds such as coreference, and the topic-comment or presuppositional structure of the next sentence. Conversely, if a speaker already has a representation of a FACT to be expressed, this FACT may be held in storage to first express a FACT that provides the necessary semantic 'preparatory information': conditions, introduction of referents, presuppositions of another kind, preparatory speech acts (e.g., 'Excuse me, . . . ' 'Good morning,... ').

   After the discussions in this and the previous chapters it is not surprising that a next assumption should be that the STM buffer contains a *macrostructural* unit (macroproposition, MACROFACT). Such a unit would form the *semantic plan* in the production plan of the discourse. It would contain roughly what will be said, (viz., the topic of the discourse or conversation going on). The control function of this macroproposition is obvious: It guarantees the global coherence of the sequence as a whole and it provides the 'background' for the more local connections between sentences.

We have studied examples where such connections could not be established without an underlying semantic topic in the form of a macrostructure.

Plans of this kind *are provisional* in the same sense as macrohypotheses in comprehension are. We have seen that the interaction has so many intervening variables, mainly the verbal and nonverbal reactions of hearers, at least in oral communication, that semantic plans often need reformulation due to local feedback: Another topic becomes necessary. There are multiple social and personal reasons for such a change, and the changes may be free, optional, probable, or even necessary. We may simply *want* to talk about something else; the perceptual context *induces* a new topic (about what happens now); the actual topic is socially delicate and should not be 'pushed,' there may simply be nothing more to say about the topic; etc. Both the linguistic and the cognitive and social constraints on topic change need extensive further study. Such a theory would be an important component in a theory of macrostructures.

6.13.4. Interesting of course are the processes which lead to the *formation of macro-propositions* in production and those which so to speak 'specify' these macro-propositions at the local level.

To understand the formation of semantic representation in discourse, we should recall that discourse is part of a speech act that is again part of (verbal and other) interaction sequences-that is, semantic plans are part of the more global plan to execute a certain speech act with a global goal (viz., to change the cognitions and actions of the hearer). Basically, then, we want the hearer to *know* something (e.g., about what we know, believe, want, or evaluate) and the hearer eventually to *act* upon this knowledge. So, in semantic plans the macrostructures function not only to organize local semantic production but also as a focus upon what is *relevant* for the communicative process: what the speaker wants that the hearer at least can understand and memorize.

Hence macrostructures of production plans must originate in episodic representations of the speaker about the *wanted* cognition (and indirectly actions) of the hearer, which constitute the *results* and *goals* of the global speech act. The cognitive formation of goals from motivational structures has been discussed previously. From there several global actions may be executed, among which is the production of a discourse (viz., a specific global speech act (like a request) with a specific content, which is the macroproposition. From the cognitive set of an agent speaker is therefore received the information which leads to the formation of a global topic (what we globally know, globally want, globally find...) which will be stored in episodic memory. From this global topic more specific topics can be derived and be arranged in hierarchical lower order. At the lowest semantic level, then, actual production may start with the storage of the initial topic in the STM buffer, and the actualization of the respective FACTS, under the control of the topic, from EM to STM. There are several theoretical possibilities here.

First, the sequence of propositions or FACTS is generated by EM itself, then given to the STM buffer, and then formulated and expressed. This would however not be consistent with our view that *all* semantic operations take place in STM. Hence we must assume that in STM the formation of goals/ results is inferred in the decision process of motivation and hence also the global content of the speech act. Then, this global semantic plan, under direct execution and in rather simple tasks, may be used directly in STM for production. In more complex discourses, the global topic first should be stored in EM; then subordinate topics should be derived; and thus a hierarchical semantic plan can be constructed for EM.

At the local level, we then have actualization of a topic in the STNI buffer and the formation of actual FACTS in STM. Clearly, in this process we again need world knowledge and other factors of the cognitive set; that is, if we want to tell about a trip we have made, we derive local knowledge either from our actual *memory* of the trip or from general knowledge about frames and scripts. Otherwise we might follow the *schematic* organization of the knowledge involved (e.g., when we explain to somebody how to repair a car) or of the pragmatic or action plans we have (convince somebody to lend us money, etc.).

We can merely speculate about this process of *derivation* of FACTS from global topics (MACROFACTS). Given certain frames and scripts, we could imagine the application of the converse of the CONSTRUCTION rule (viz., SPECIFICATION). In that case, normal conditions, respective components, and consequences of a global FACT are specified. Pragmatic constraints determine the selection: what is interesting to be told, what must be known by the hearer, etc. Semantic conditions of coherence determine which *minimal* information must be formed to represent *new* information; that is, we do not simply express our conventional knowledge but want to tell something new (about what we know, believe, want, or find) embedded in a frame or script (e.g., what happened to us in the restaurant or train). This *new* information may come from our episodic memory for past experiences or from the motivation system.

The next formation rule for semantic information would be the converse of GENERALIZATION (viz., PARTICULARIZATION). Knowing about or wanting a general property of, say a group, we may particularize the more specific property and who has it. Assume that a speaker knows globally 'that few members were at the meeting' and that he wants his hearer to know this too; in addition he wants to be more particular about the members and why they were not there. In that case the following propositions/ FACTS could be formed:

(29)   John was ill. Peter had to visit his mother. Jane's plane was delayed by a storm…

In wanting, globally, to be helped we may say:

> (30) Can you please peel the potatoes? And you, could you open these cans, ... ?

Finally, we have the converse of DELETION in the form of various ADDITION operations, in which we may specify local details about situations or events.

6.13.5. We have seen earlier that the representation of discourse in episodic memory during comprehension at the same time also is a representation of the situation and/ or events described by the discourse. In production a similar state of affairs would hold: We have a certain representation of a situation and/ or of a sequence of events, drawn from episodic memory about them or generated from other elements in the cognitive set, and part of this representation is also the representation of the discourse to be produced. The hierarchical structure of memory for situations and events, or the relevance of specific attitudes and opinions about them, in such a case at the same time provide the macrostructures for the discourse, depending on the pragmatic constraint determining what is relevant for the communicative event. Under the control of this semantic-pragmatic macrostructure the converse macrorules may be applied in STM to generate the specific FACTS, as they may be directly drawn from episodic memory or inferred from knowledge or other cognitive set systems.

Important in this generation, then, is the *linearization* of the information. The global ordering is determined by the conditional ordering of the macropropositions on the one hand and by *superstructural schemata* for the discourse type on the other hand: First we must generate a Setting when telling a story, and this Setting must be filled with a global state descriptions. And then the respective local FACTS must be generated according to the rules and strategies of local coherence and connection. For actions and events this ordering in general has to respect the conditional and temporal ordering. In state descriptions other constraints on ordering (e.g., from general to specific or from whole to parts) may be applied. Of course, the ordering in semantic production need not be identical with the ordering in the memory representation of certain events: It may be necessary for the particular communicative context first to tell about the main results or consequences and then to give earlier events as 'explanation'. In other words, depending on pragmatic and other contextual constraints, the speaker may apply the various *semantic transformations* that we discussed for the retrieval stage in reproduction.

Finally, in the actual execution of the respective semantic representations the usual semantic constraints on linear coherence and connection must be respected, as they have been discussed before. Thus, given the semantic

contents of the STM buffer, containing at least a macroproposition and a small number of FACTS, these FACTS may be connected and ordered. Those FACTS that are assumed to be known by the hearer, as well as general knowledge underlying coherence, need not be expressed in that case and are in the buffer only to establish coherence for the speaker.

6.13.6.   It is clear from this tentative discussion about discourse production that we know very little about the precise Processes involved. Yet, we may safely assume that this production is impossible, at least when complex discourses and conversation are involved, without the construction of a global semantic plan. This macrostructure is presumably derived from memory of more general knowledge and progressively specified by more particular subtopics. This global representation of the contents of the discourse to be produced is fed into the STM buffer, which then provides the information and control for the actual formation of FACTS in STM. These FACTS may be drawn from the EM representation of the discourse/event (viz., from the part dominated by the actual topic) or directly derived from more general frame and script knowledge. Actual linearization finally is based on knowledge about conditional and other kinds of linear connection and coherence and pragmatic knowledge of the situation (what should be said first, what need not be said, etc.). Further theoretical and empirical research about the properties of this sketchy model of discourse production is of course necessary. Especially the generation of particular FACTS in STM under the control of a global topic needs to be investigated further, as well as the interaction between episodic memory for situations and events and more general knowledge, opinions, and attitudes and their common links with the motivational structure of speech act and discourse production.

6.14. MACROSTRUCTURES IN OTHER COGNITIVE DOMAINS

6.14.1.   At the end of this chapter it is necessary to make some brief remarks about the role of macrostructures in other cognitive domains. That they play an important role in such complex tasks as action and discourse processing may be obvious now, whatever detailed insight into these processes is yet lacking. We have assumed that macrostructures are a necessary property of any kind of *complex information processing.* This would mean that they must also play a role in perception/vision, thinking, problem solving, and related mental activities. Work in this area, without explicitly using notions such as 'macrostructure,' seems to indicate that complex tasks of this kind also require higher-order organization of different kinds.

6.14.2. Complex *visual* information processing takes place in the perception and interpretation of complex pictures, natural scenes, episodes, or movies. Part of this interpretation process has already been discussed for (inter-) action, where doings are observed (viz., certain bodily movements of persons). The principles in visual information processes are not very different from those in other cognitive domains. From continuous and 'parallel' or 'configurational' input, the initial processors have to construct *meaningful* objects, properties, and events. This means that processes of selection, identification, and inference from knowledge about the visual shape of such objects take place: Objects and relations between objects are recognized. The knowledge structures involved in this process may again have schematic, framelike, or scriptal character.[38] We have schematically constructed knowledge about the basic features or global configurations of chairs, flowers, or humans. Since actual objects may be individually variable, this general knowledge must be flexible, have open slots, and must provide for default values for those properties of the visual image that are not actually seen.

As soon as more complex visual data are involved, we no longer have ready-made knowledge schemata so that comprehension must take place by *construction* and hence by rules: In this way we 'understand' an accident when we see one even for the first time. The problems we have encountered in the processing of complex sequences of propositions of FACTS in discourse also arise here, but in addition we have the problem that information must be selected and constructed from a complex static or changing 'picture' -that is, much visual information is presented at the same time, and we therefore must know what is *relevant,* what is *important*, and how we construct *global wholes* from details or components. We recognize the typical notions involved in a theory of macrostructures, and we assume therefore that the interpretation of images also takes place with global structures.

Global processing of visual data is necessary to *organize, reduce*, and *understand* very complex information. This means that we construct higher-level objects that allow us to understand visual detail and to establish global relations in the picture. In this way our global understanding of a street scene will globally be constructed by the presence of components such as open air (above), houses (on the sides), pavement (below), and traffic and people (on the pavement), which are arranged in a possible schematic order.[39]

Of course this global analysis does not start from zero. First, we have serious *expectations* about the presence and structure of such a scene: When we leave the door of our house, we already have a global representation in the

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[38]See Minsky's well-known paper (M insky, 1975), which is mainly about the role of frames in visual information processing. See also Klatzky and Stoy (1978).

[39]See Biedermann, Glass, and Stacy (1973).

STM buffer of such a street scene (and not, for instance, of an ocean scene). This hypothesis may be confirmed by the global analysis of the visual input. The theoretical problem, then, is: How does such a global analysis take place? To know or verify globally that a house is a house, we apparently *first* need to see the components of the house, whereas conversely these components can only be understood in relation to the global picture. We assume, then, that the visual input data are subjected to *macroanalysis*; that is, we first apply DELETION to abstract from irrelevant details such as the number of windows or the color of the house. Second, we try to apply GENERALIZATION: A number of moving objects of a certain size (cars, trams, buses) is interpreted as traffic. Finally, a certain configuration of global objects, with normal components, properties, and locations, will by CONSTRUCTION yield a higherlevel of object (e.g., a street or a room). These rules, however, can only be applied in the form of hypotheses and according to strategies. We have seen that the strategical interpretation of pictures first draws upon generated expectations. Second, global scanning of a picture yields a number of *crucial* data, such as global configurations of objects and collections of objects, which may be compared with the schematic knowledge in memory about such scenes.

Given the global analysis and identification of objects and complex scenes, attention may be focused on 'local' visual data. We assume that focusing of this kind essentially depends on cognitive set factors: motivations, tasks/goals, interests, etc. Hence if we want to take a bus in the street, we selectively focus attention on objects satisfying the crucial bus features and next on particular properties of the bus, like the correct number, form, or color if these are known to be variable.

6.14.3. In this discussion we ignore the problem of whether the comprehension of visual information is based on abstract (for instance, propositional representations) or pictural (analog) structures of some kind.[40] For each hypothesis, the necessity of macroanalysis and macroconstruction is necessary. If we would have pictorial representations, we would also need 'schematization' by the deletion of details, generalization, and construction on the basis of normal properties and components. Any reproduction of a natural object or scene, as represented in memory, exhibits the typical macrostructural features just mentioned, plus, in direct reproduction some occasional detail (if focused upon specifically due to cognitive set factors) and the usual output or production constraints. In this respect memory for pictures is very similar to memory for discourse. On the other hand it seems that recognition for visual data is more accurate than for semantic information from discourse, especially at the local level: We

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[40]See Paivio (1971) and Pylyshyn (1973).

recognize an object, face, or a particular street we have seen this morning better, it seems, than a sentence we have heard this morning. Whether this is due to different processing (e.g., the establishment of links with more information units), we do not know. More comparative experiments should be carried out to establish this assumption.

6.14.4. One step more complex still is the visual analysis and comprehension of *episodes*, containing actions and events. Not only a background situation should be constructed as above (e.g., a room or the street) but at the same time the changing movements, directions of movement, etc., should be interpreted (e.g., as driving, walking, or other events). Higherlevel interpretations of actions, such as repairing a car or cashing a check, have been discussed earlier. The problem here is how continuous visual data input is matched with event and action concepts at lower levels and especially how such complex sequences of visual data can be assigned a global interpretation such as 'accident,' 'repairing,' or 'taking a bus.' We assume that such complex, higher-order interpretations are not derived from the immediate visual data but from already interpreted data on which specific construction rules are applied. With the interpreted information about two cars moving in the street and hitting each other we already construct the global event of an accident-especially if in addition auditory information confirms the hypothesis.[41] In other words, the global interpretation of image sequences, such as episodes, strips, or movies, is based again on the assignment of higher-level conceptual structures. In discontinuous picture sequences, that is, both in the interpretation of strips and the interpretation of discontinuous (selected) 'views' on real scenes, we witness something similar as in the interpretation of incomplete discourse: Connecting propositions or FACTs are derived from previous, contextual, and knowledge information, so that the necessary coherence can be established and global structures adequately derived.

6.14.5. Finally, we may assume that in *thinking* and *problem solving* similar processes of global planning and analysis of complex information are involved.

It has been observed in various types of protocols of problem-solving procedures that the problem is first given a global analysis and representation.[42] This means that a global goal or result or a sequential goal or result are represented that constitute the overall or final wanted state of affairs (the 'solution'). Given the initial state and final state at this global level,

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[41]For experimental evidence about the constructive nature of episode interpretation, see Loftus and Palmer (1974).
[42]See Newell and Simon (1972).

inferences may be made about the global possible consequences and the global possible conditions of these respective states. The initial state, for instance, may be a representation of the situation or background for the solution of the problem. Only after such a global analysis of the problem, the situation, the goal or result, or the overall constraints of the subsequent mental or overt actions, specifications of more local and sequential steps makes sense. During the execution of these local steps the STM buffer must again keep track of the more global goals, so that (at each time where a decision about a next action must be made) the actual operation being carried out and the final or global result/ goal can be matched and evaluated for the probability of their indirect stepwise connection. Details of problem-solving procedures and strategies are not discussed here. For a concrete example in the domain of language and interaction, we refer to the conversation analyzed in Chapter 5, where the speaker has as his task to make a complex request and the goal is to have his dissertation typed. Of course, many other *types* of problem solving exist, but as soon as they have a complex nature, we witness global analysis, global evaluation, and a global control of the execution of the respective steps.

6.15. CONCLUDING REMARKS

6.15.1. In this chapter many problems of a cognitive model of complex information have been discussed. This discussion, constrained both by the limitations of one chapter and by the current state of our insight into the properties of global processing in various cognitive domains, has been very sketchy and at times purely speculative. The speculations however have been systematic, being extensions of theoretical and empirical findings (e.g., in discourse comprehension and recall), which have been confirmed in convergent results of much current work in psychology. Instead of trying to give a detailed, formal, and experimental analysis of a minor fragment, we have preferred to sketch the *global* outlines of the theory: In that respect we indeed have merely constructed the 'macrostructure' of an actual processing model. We wanted to show or at least to suggest that the principles in the various domains are the same, thus linking such complex cognitive processes as those underlying discourse and interaction, both in production and in comprehension and storage.

   Part of the theoretical basis of the structures involved in the representation of discourse and interaction in memory has been provided in the earlier, 'structural' chapters. In this chapter we merely want to add some additional but crucial suggestions about the properties of the cognitive processes and the interaction between the comprehension of input and various kinds of knowledge and other elements of what we call cognitive set. We want to stress

that on the one hand complex information cannot be comprehended without the formation of macrostructures and on the other hand that both at the local level and on this global level of understanding important other factors play a role, such as motivations, action design (tasks/ goals), interests, opinions, and attitudes. It is this latter point that emphasizes the complexity of discourse processing in 'natural' contexts and therefore the close interdependence of issues in cognitive and social psychology. It may be expected that serious insight into the comprehension and storage of information from discourse and the urgent deeper understanding of the processes of learning from text; the formation and transformation on beliefs, opinions, attitudes; or motivations in the course of communication can only be arrived at if we pay attention to the interaction between these various factors of the cognitive set during comprehension.

6.15.2. Not only is our discussion of the cognitive aspects of macrostructures sketchy but also we have met a great number of open problems or even 'mysteries.' We have discovered progressively that what goes on during the comprehension of sentences and sequences of discourse, although already highly complex on its own, takes place at the same time and against the background of processing of pragmatic, social, and visual information: A speech act must be understood; a global speech act must be constructed; the social and pragmatic context must be analyzed and matched with the textual information; visual information must be both analyzed. and matched with the information from actions and discourse being performed; our own knowledge and other cognitive systems must be updated; motivations must be formed and specified in decisions; goals must be pursued and problems solved; strategies be designed and executed, ... It is clear that if all this is going on in a few seconds during the comprehension or execution of subsequent sentences of a discourse or doings of an interaction, our assumptions about short-term memory storage, the capacity of the buffer system, the role of episodic memory, and the 'semantic' and hence 'exclusive' nature of all these activities require a cognitive model that is still more powerful than the one we sketch in this chapter. To be sure, part of the problem has been solved by the postulation of fundamental rules and representations at the macrolevel, which allows strong organization and reduction of complex information, but yet this does not solve the problems around the interaction of these various macrostructures for the respective tasks being accomplished during *multilevel* understanding. Perhaps a powerful model of *parallel* processing of complex semantic information should be developed, yielding hierarchical and multilayered representations in episodic memory, being intricately connected by various mapping or translation rules.

Not only the astonishing complexity of the various cognitive tasks and domains being involved in comprehension has many white spots on our theoretical map of cognition, but also apparently simple tasks as the establishment of connections between subsequent sentences leaves us with many unresolved problems: first, of course, how the sentences themselves are understood, an immense problem nearly fully ignored in this book; next, how we know that two sentences in a sequence make a meaningful sequence; how knowledge is searched, found, and applied to establish connection, without the actualization of an exploding amount of conceptual information linked, in memory, with the concepts in the respective sentences. The multiple 'go betweens' between STM analysis and comprehension, on the one hand, and LTM, on the other hand, have hardly been identified. The organization of memory in terms of frames, scripts, or other schematized forms of chunking and structuring are only a first step toward the solution of such a problem.

Finally, we have seen that still very little is known about the representations and processes of *production*. How a simple action or sentence is produced; what the underlying motivations, interaction with knowledge, and other cognitive set factors are; and finally how formed semantic information is formulated and expressed or executed are issues about which we merely can guess the outlines. Again, extrapolation and extension from findings in comprehension and the application of theoretical concepts together with reasoned introspection are the few heuristic tools we have in the construction of a production model for discourse and action. Only with such a model however it makes sense to have directed experiments being carried out which may confirm hypotheses or which may provide data for further development of the model. This too is an important area of further cognitive research about complex information processing.

6.15.3. That the notion of macrostructure plays an important role in our cognitive model of complex information processing, as well as in the linguistic and sociological theories of discourse and interaction, has been obvious in this book. In a more modest tone though we would finally like to stress that it is just *one* of the important notions -and problems- involved in such a model. Global analysis, for instance, is impossible without understanding of the complex local processes in action and discourse. Similarly, macrostructures organize complex information, but we still must know what this information is; what other organizational principles (e.g., in terms of frames or scripts) are involved; and especially what processes are involved in storage and retrieval; which properties should be postulated for the various memory systems; and last, but not least, how the various cognitive systems of knowledge, motivation, opinions, and attitudes are constructed and mutually

related. A sound theory of macrostructures, as part of a cognitive model, can be developed only in relation to insight into these other problems.

6.15.4.   Finally, it should be stressed that many aspects of a cognitive model of global processing have not been mentioned at all. First, we have neglected the *developmental* properties of macrostructures: When and how are macrorules and superstructural rules learned? When are children able to summarize discourses (e.g., stories) or to perform other 'global' operations that require complex processes of inference and knowledge manipulation?[43] It may be clear that further insight into such problems is crucial for our understanding of social learning (understanding and planning interactions) and of learning from discourse, which plays such a dominant role in our education system.

Similarly, although we have conceptualized certain personal differences in terms of variable cognitive sets, it is obvious that also other differences are involved in the many higher-level tasks described in this book.[44] We have briefly mentioned personality but also elementary differences of 'intelligence' and the application of strategies, memory capacities, personal 'styles,' etc., are involved. Thus, it has sometimes been observed that subjects may differ in their tendency to emphasize more or less on local and global information processing, respectively.[45]

Further differences may be observed in *pathological* conditions. In the study of brain lesions of certain kinds it was noticed that subjects sometimes loose their ability for the global understanding and planning of discourse and action so that only local coherence is possible. Conversely, difficulties may arise in the 'particularization' of information given some more global themes or plans.[46] Similar problems may arise in various kinds of semantic aphasia and schizophrenia.[47] From these findings we might conclude that macroprocesses are not merely a theoretical device in a cognitive model but that they have separate cognitive or even physiological 'reality.'

From these final remarks it has become obvious that in addition to the many further problems mentioned earlier in this section much of the more subtle and interesting theoretical work is still to be done. Especially relevant

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[43]Developmental aspects of story comprehension have been studied by Kintsch (van Dijk & Kintsch, 1977), Wimmer and Grässle (1978), Denhière (1978), Mandler and Johnson (1977), and Mandler (1978).

[44]See Perfetti and Lesgold (1977).

[45]See the replications and further development of Bartlett (1932) given in Paul (1959), concluding that two basic styles of text reproduction and construction may be observed.

[46]See the report of some old clinical work by Luria (1973, chap. 12).

[47]See especially Engel (1977) for recent work on aphatic conditions in discourse production and comprehension.

applications in education[iii] (learning from discourse), problems of social psychology (influence on knowledge opinions, attitudes, etc.), psychotherapy and psychopathology (brain lesions, aphasia, schizophrenia, neuroses of many kinds, etc.), and cognitive and social development need further work in this area of complex human information processing in which macrostructures play such an important role.

See Frederiksen et al. (1978).

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