representation is connected with the value of Actor, with that of Objective, of Addressee, or, perhaps, with that of another complementation.

If it is possible in such a way to restrict the framework to a single level of syntax, this level could be one of those the specific status of which has been recently claimed by Chomsky within his minimalist program, viz. one of the 'interface' levels, the necessity of which is beyond doubt. Certainly, the differences between this syntactic level and Chomsky's logical form should then be discussed as interesting issues of a more or less technical character.

2 SENTENCE STRUCTURE AND COMMUNICATION: FOCUS, NEGATION AND PRESUPPOSITION

The aim of this part of the book is to point out that the patterning of the sentence connected with its use in communication, i.e. its articulation into topic ("given", contextually bound part) and focus ("new", contextually non-bound part), requires either a significant enrichment and modification of the theory of principles and parameters (Section 2.1), or an approach based on valency (dependency), rather than on constituents (Sect. 2.2). We then proceed to show how the scope of negation is co-determined by the topic-focus articulation (Sect. 2.3), and how the articulation also is relevant for presuppositions (Sect. 2.4).

Since the topic-focus articulation (TFA) is patterned by grammatical means, it is appropriate to understand it as constituting one of the basic hierarchies of the underlying structure of the sentence. Therefore, in a formal framework of a generative description, the articulation has to be included, and the task is to find a relatively economical way in which the core of such a framework could be formulated. In Section 2.5 it is pointed out how this can be done in the shape of a few general principles referring to data from lexical entries (especially to valency grids).

2.1 Principles-and-Parameters Theory and the Underlying Order of Constituents

After an introductory remark (2.1.1) and a short formulation of the task of this Section (2.1.2), we present a set of initial assumptions (2.1.3), a discussion of a possible location of the order of constituents in the given framework (2.1.4) and a formulation of three principles concerning the order of constituents and its relationships to the topic-focus articulation (2.1.5), which is then substantiated by an illustration (2.1.6).

2.1.1 From a certain point of view some of the basic aspects of the order of major constituents seem still to lie beyond the main concerns of most

generative grammarians, though this issue played a highly important role in the split of the transformational grammar in the late sixties into interpretative and generative semantics (cf. Chomsky, 1968; Lakoff, 1969) and though also in the recent development of Chomskyan Principles-and-Parameters, or Government-Binding theory (GB) it cannot be left out without mentioning (cf. Chomsky, 1982: 8, 27f, 31, 34, 39, 93ff, 121, 128, 133, to quote only the most relevant places).

The efforts towards a systematic description of TFA within GB have culminated in Rochemont (1986), who, as pointed out by Koktová (1988), comes close to the dependency approach by accounting for accent and focus in terms of argument structure; however, even in his approach the constituency based treatment of focus inheritance is not sufficient for such sentences as *Laurie follows one of her schoolmates into the garden*. We assume that this sentence can be used as a (full, i.e. redundant) answer to (i) What does Laurie do?, (ii) Where does Laurie follow one of her schoolmates?, (iii) Where does Laurie follow whom?, (iv) What does Laurie do with (regard to) one of her schoolmates? In case (i) the focus of the example sentence is its VP, and with (ii) it consists of its Directional; these are the two cases Rochemont can account for. However, in case (iii) Directional and Objective belong both to the focus (the verb being a part of the topic, as the question indicates), and with (iv) only the verb and the Directional are in the focus; while the latter two cases resist a constituency-based account, they can be described without any additional means within the dependency-based approach we characterize below.

Before passing to this approach, let us first propose an account of a collection of empirical phenomena closely related to the order of constituents within the rule system and the subsystems of principles as advocated by GB. This does not mean to make any claims of changing the core of the theory as such.

2.1.2 Taking for granted, for the purpose of our present discussion, that
(i) universal grammar consists of interacting subsystems, which, from one point of view, are the various components of the rule system of grammar, and, from another, *the subsystems of principles* (Chomsky, 1982:5),
(ii) the components of the rule system are the base, a transformational component (transforming D-structures into S-structures), a LF-component (deriving logical forms from S-structures) and a PF-component (transforming S-structures into phonetic forms of sentences),
our task can be formulated as follows:

(1) to summarize first the hypotheses that we have found to be relevant for the order of constituents;
(2) to propose at which level of the general scheme of the system the order of constituents should be assigned;
(3) to look for a possible "division of labour" between the rule system and the subsystems of principles to account in an adequate way for the issues connected with the order of constituents.

2.1.3 A long-term empirical investigation by linguists of most different orientations in general and the Praguian efforts to arrive at a systematic account of the issues under discussion within FGD as a specific framework of generative description of language in particular have led to the following substantial assumptions (see Sgall et al., 1986, esp. Chapter 3):

(a) There is an intrinsic (basic) ordering of the types of complementations of verbs (theta-roles, in a broader sense of the term, or arguments and adjuncts, see below), given by the grammar of a particular language, which is observed in the underlying structure in the unmarked case, i.e. in case the given complementations convey contextually non-bound information (they belong to the focus of the sentence); in the sequel, we will refer to this basic ordering by the term *systemic ordering* (SO); as for its specification, see Sect. 2.2 below.

(b) For each sentence there is an underlying order of its constituents that corresponds to the degrees of *communicative dynamism* (CD); as mentioned in (a), CD coincides with SO in the focus part of the sentence, while in the topic part (contextually bound items; roughly speaking, that part that renders what the sentence is about), CD is given by the degrees of salience of the items referred to and by other factors concerning the structure of the discourse; CD is semantically relevant (cf. the distinction in truth conditions between (1) and (2)) and in the surface shape of the sentence the same CD may be rendered by various means, cf. (3)(a) through (c) for the CD *Mary - flower - John*, which differs in its presuppositions from e.g. *John gave Mary a FLOWER* in that (3) presupposes that Mary was given a flower by someone, whereas in the just quoted sentence it is presupposed that John gave something to Mary (without discussing less probable readings).
Here, as well as in the sequel, the capitals denote the bearer of the intonation centre.

These sentences thus differ in a similar way as *One of the boys came LATE* differs from (*It was*) *One of the BOYS* (*who*) *came late*. The CD in (4)(a) through (c) is again identical, differing from that of (5) and (6) in an analogous way.

(1) Everybody in this room speaks two LANGUAGES.
(2) Two languages are spoken by everybody in this ROOM.
(3)(a) Mary was given a flower by JOHN.
(b) It was JOHN who gave Mary a flower.
(c) JOHN gave Mary a flower.
(4)(a) Last year John came to Stanford from CAMBRIDGE.
(b) Last year John came from CAMBRIDGE to Stanford.
(c) John came from CAMBRIDGE to Stanford last year.
(5) Last year John came from Cambridge to STANFORD
(6) John came from Cambridge to Stanford last YEAR.

In addition to the difference in presuppositions it should be recalled that these sentences differ in their potential to answer particular questions. This concerns also sentences with which a difference in presupposition is absent (or covert); thus the set of possible contexts may be used as a criterion for distinguishing between topis and focus. The three sentences in (4) all can answer the question *From where did John come to Stanford last year?*, whereas (5) is rather a full (redundant) answer to *Where did John come from Cambridge last year?* and (6) can answer *When did John come from Cambridge to Stanford?* (Similarly, the three sentences in (3) all can answer a question for the Actor, in contrast to *John gave Mary a FLOWER*, which answers a question for the Objective).

(c) Every sentence splits into its *topic* (conveying the contextually bound or "given" information, specifying those items that the speaker mentions as belonging to the foreground so that the hearer may identify them in his stock of knowledge to be able to modify them) and its *focus*;[14] the dichotomy of topic and focus is relevant for the assignment of the semantic scope of negation. In other words, the dichotomy is responsible for some of the presuppositions of the sentence (in the given reading).[15]

[14] We leave aside for the purpose of this discussion the embedded elements, which can belong to the topic even if contextually non-bound, and to the focus, even if contenxtually bound, cf., e.g., *best* and *your*, respectively in *The dress I like best was made by your mother*. It should also be noted that there are sentences lacking a topic (e.g. starting a narrative text: *A boy walked through a large forest*).

[15] As for the placement of the boundary between topic and focus, most of our examples are ambiguous, especially the verb belongs to the topic in some of the readings and to the focus in others.

2.1.4 When we try to locate the account of the order of constituents in a specific place of the rule system and the system of principles, we must emphasize one point: Since the underlying (deep) order, which may differ from the word order of the phonetic form, has its consequences for the semantic interpretation of the sentence, it follows that this order should be at the disposal of the LF-component; at the same time, as we have illustrated by (3), the phonemic component (now called by Chomsky the phonetic form component) may assign a given order of constituents different phonetic forms (differing in the surface order of constituents, in a combination of some of these with specific function words, or in the placement of the intonation centre). Thus the points in the rule system that are possible candidates for the representation of the order of constituents are the D-structure and the S-structure.

There are two alternatives:

(i) Taking into account the assumptions (a) and (b) in Sect. 2.1.3 above, we can say that SO should be represented in the D-structure, while CD should belong to the S-structure. Since SO is specified in terms of types of complementations of verbs, which more or less correspond to theta-roles, the D-structure seems to be an appropriate place for accounting for (a). D-structures are mapped to S-structures by the rule "Move-alpha"; perhaps this rule could be formulated in such a way that it would rearrange the constituents according to their degrees of CD; the traces left behind the shifted constituents would not then be assigned any position in the hierarchy of CD.

(ii) An alternative solution would be to let the base generate directly the order of constituents coinciding with the CD of the constituents of the sentence generated. When characterizing the D-structures, Chomsky (1982:39) states that it is the representation of theta-roles assignment and has also the properties that follow from X-bar theory and from parameters of the base in a particular language among which he mentions also the ordering of major constituents. Under this approach, the role of the "Move alpha" rule would be considerably reduced in comparison with the role this rule would play in alternative (i).

As example (4) above illustrates, the rule "Move-alpha" should be adjusted in order to be applicable to one or more elements of the topic (contextually bound items) to transfer them to the end of the sentence, to the right of the intonation centre. While in (4)(a) this optional rule is not applied (CD coincides with the surface word order), in (b) it is applied to *to Stanford*, and in (c) first to *to Stanford* and then to *last year*. The moved items do not acquire additional stress, the intonation centre is assigned (by phonemic rules) to the item that is marked as most dynamic (i.e., with alternative (ii), occupies

the rightmost position in the D-structure). It is an open question whether with this approach also the three variants of (3) can be handled by rules deriving S-structures from D-structures.

2.1.5 If we accept the position (ii), taking D-structures as the direct representation of CD, it remains to examine the assumptions (a) to (c) from the viewpoint of the interplay of principles, rules, and lexical conditioning.

It seems possible to add to the theory the following subsystem of principles:

(A) The basic (unmarked) ordering of theta-roles (SO) can be determined by lexical means, in a way similar to what Chomsky calls "projection principle": in the lexical entries of the base component not only the theta-roles possible (optional) and necessary (obligatory) as complementations of the given lexical item are specified, but also their SO. If the hypothesis that SO is identical for different grids or "frames" (subcategorization properties of different lexical items) concerning the same word class is found to be plausible for the given language, then the "frames" can contain just the numerical values which can be assigned to theta-roles according to their position under SO. This approach has been formally elaborated in Hajičová and Sgall (1980) and Plátek et al. (1984); in the latter paper a framework is presented that covers also the main features of the interplay of the theta-role assignment and the syntactic relations of coordination and apposition; now see also Petkevič (1987).

(B) A second principle can state that whenever a D-structure contains two items A and B, where SO(A,B), but CD(B,A), then B is contextually bound, i.e. belongs to the topic (here X(Y,Z) is read "Y precedes Z under X").

Recalling our examples from Sect. 2.1.3, *John* in (3)(a) through (c) is assigned the theta-role Actor, *Mary* is assigned the role Addressee; in the SO of English Actor precedes Addressee, while in the CD in (3)(a) through (c) Addressee precedes Actor. Thus, the sentences say something about the Addressee as (a part of) the topic; *Mary* is a contextually bound element of the sentence referring to a person who belongs (at the time point of utterance of the sentence) to the activated part of the stock of knowledge (information) shared by the speaker and by the hearer.[16]

[16] For the notion of the stock of shared knowledge and the hierarchy of activation of its elements, see Section 3.1 below.

(C) In a similar vein, on the basis of SO and CD one can specify what is the topic and what is the focus of the given D-structure; for the tectogrammatical (underlying) representations as defined in FGD (based on oriented rooted trees) this was done by Sgall (1979). The corresponding principle can be so formulated that at least one element of the highest subtree is contextually non-bound, where 'highest subtree' is the subset consisting of the verb[17] and the constituents assigned the theta-roles determined by the verb according to (A), as well as the adverbials of all kinds belonging to the projection of the verb. The contextually non-bound elements of the mentioned set constitute the focus of the sentence (together with the embedded items belonging to them). Thus every sentence contains a focus, whereas the presence of a topic is optional; in the prototypical case the thetic judgements correspond to topicless D-structures. (Let us note that this principle allows for exceptions, in which the focus is more deeply embedded, see, e.g., example (8) below.)

2.1.6 The importance of the inclusion of a description of such phenomena as listed above into general linguistic theory can be now illustrated more explicitly, e.g. on the difference in the meaning of (7)(a) and (7)(b), capitals again denoting the intonation centre.

(7)(a) Staff is allowed behind this COUNTER.
(7)(b) STAFF is allowed behind this counter.

In (7)(a) one speaks about the staff, or, perhaps more probably, about the rights of the staff, and states that (one of) the right(s) is to be behind the particular counter; more technically speaking, *staff*, and, on a preferred reading, also the verb belong to the topic, whereas the adverbial constitutes the focus.[18] In contrast, (7)(b) speaks about that particular counter (topic) and states that the persons who are allowed to step there are the staff. Note that the two sentences differ (at least on their preferred readings) in the truth conditions: If I am a member of the staff, I should be behind the counter

[17] Auxiliary verbs as well as prepositions and conjunctions are assigned no theta-roles and no positions in CD, since their underlying counterparts are indices of complex labels, rather than nodes.

[18] Another issue then is whether the syntactic relation expressed by *behind* belongs to the focus or not.

(rather than somewhere else), if I receive and accept the message expressed by (7)(a), which is not the case with (7)(b).

As for the theta-roles in both (a) and (b), *staff* is assigned the role of Objective, *behind the counter* the role of Location (it is not decisive for our point whether there is no Actor role assigned, or whether the role of a General Actor is assumed to be present). In the SO of English, Objective precedes Locative; (7)(a) and (b) differ in their CD, which in (a) is in accordance with SO, while in (b) the CD is Locative - Objective. Thus for (7)(b), there is only one relevant reading, namely that having the Locative (and the verb) as contextually bound. In (7)(a), the Locative is the last (most dynamic) item of the D-structure and thus is contextually non-bound according to the principle (C) (i.e. under the natural assumption that there must be at least one non-bound item, if the sentence is to bring some "new" information); the Objective is contextually bound, and so is the verb, in one of the D-structures; an ambiguity of the appurtenance of the verb to the topic or to the focus is a common phenomenon.

2.2 Prague School Approach to Topic and Focus

The aim of the present section is to give a brief survey of the theory of topic and focus as developed within the framework of FGD. To make this sketch easy to survey, considerations about the background motivations are left aside here; for a more detailed treatment see Sgall, Hajičová and Panevová (1986), Sgall and Hajičová (1977), Sgall, Hajičová and Benešová (1973), Sgall, Hajičová and Buráňová (1980); a formal treatment can be found in Hajičová and Sgall (1980a), more recently and in much more detail see Petkevič (1987).

2.2.1 The theory of TFA in the framework of FGD stems from the research on this phenomenon undertaken within the Prague School of Linguistics since V. Mathesius. One of the principles this school has always proclaimed and observed is not to ignore anything that was published on the issues one studies. So let me start by mentioning that the importance of the phenomena now often subsumed under the headings of theme/rheme, topic/comment, presupposition/focus, etc. etc., was known at least since the middle of the 19th century, first in France and then in Germany, where the terms *Thema* and *Rhema* were introduced.

This reference to studies by other than Czech authors (whose contributions have been specified in Sgall et al., 1986, Chapter 3) by no means weakens the pioneering contribution of Vilém Mathesius (1915, 1924, 1929, 1936), who introduced these notions into the Prague School of Linguistics and studied the dichotomy from the viewpoint of the structural comparison of Czech and English. More than that, it was Mathesius and his followers who paid systematic attention to the interplay between syntax proper and TFA, and who were aware of the importance of the latter for language as a means of communication. Of Mathesius' observations at least one should be mentioned in this connection, since it belongs to the items still very topical and important: Mathesius (1915) noticed that English passive and active constructions serve as one of the most important means of TFA, namely they make possible for the speaker to start the sentence (in the unmarked case) with "what he wants to speak about" (topic, roughly speaking) and to add then "what is to be said about this topic" (focus, in our terms). Thus the inversion of word order that is connected in English with passivization serves the same purpose as the so-called free word order in many other languages. Mathesius also was well aware that the topic as well as the focus often consist of more than one sentence part (or constituent), and he discussed such cases with deep understanding.

Among Mathesius' followers, Firbas (1957, 1966, 1975) analyzed the interplay of this "functional sentence perspective", the syntactic structure of the sentence and word order, showing that not only a dichotomy, but a whole scale or hierarchy of "communicative dynamism" is concerned. Daneš (1957, 1970) explored in a systematic way the relationships of "theme" and "rheme" to word order and intonation as well as to the structure of text. He gave a thorough analysis of the "thematic progressions" and distinguished more subtle cases of connectedness between utterances. Sgall (1967, 1979), Sgall et al. (1973, 1980), Sgall and Hajičová (1977), Hajičová and Sgall (1980) introduce TFA into the formal description of syntax and of the meaning of the sentence.

After Halliday (1967) brought theme and rheme nearer to the centre of interest of British and American linguists, Chomsky (1968) included these questions among the central issues of syntax and semantics. However, there still is the open question: Is it a realistic task to construct a procedure assigning a sentence a set of representations indicating all appropriate assignments of its words and phrases to its topic and focus? Certain issues substantiate our conviction that this task is feasible.

2.2.2 Let us first characterize briefly the empirical background and the theoretical framework of our approach.

In uttering a declarative sentence, the speaker specifies the items of information s/he considers to be easily accessible in the hearer's memory. Further, s/he specifies what properties should be assigned to them by the hearer, into what relationships with what other items they should be brought, or what other modifications they should undergo. Natural languages use various surface means to convey this distinction: word order plays the main role in inflectional languages, specific morphemes are present in several languages of Eastern Asia, e.g. in Japanese, and intonation seems to be important everywhere, especially in the analytic languages of Western Europe; German combines in various respects the properties of the latter with those of inflectional languages.

The recursive properties of language call for a more differentiated approach than a simple dichotomy. Let us examine an example which, incidentally, instantiates the exception from principle (C), mentioned in Section 2.1.5 above.

(8) John came to the house which he wanted to BUY.

In (8) - if taken as a possible answer to *Which house did John come to?* - there are unstressed pronominal elements in the focus part of the sentence, which denote items readily accessible in the hearer's memory (*which* and *he* are coreferential with nouns occurring in the preceding part of the sentence). This points to the necessity of distinguishing between the main division of the sentence into the topic and focus and what we call the *contextually bound* and *non-bound* character of the occurrences of lexical units. This necessity is evidently connected with the recursive properties of the structure of the sentence.

It may be useful to recall that in a theoretical description of language one has to account jointly for three layers of phenomena belonging to the same domain, namely:

(i) the individual lexical items occurring in the sentence as contextually *bound* or as *non-bound*, the former use being possible only with items the speaker assumes to be easily accessible in the hearer's memory, i.e. salient, activated over a certain threshold in the stock of shared knowledge (as for the degrees of activation and for their change during the discourse, see Section 3.2 below);

(ii) the division of the underlying (tectogrammatical) representation of the sentence into its *topic* and its *focus*;

(iii) the hierarchy of *communicative dynamism* (CD, "deep word order"), rendered by the left-to-right ordering of the nodes of this representation.

Informally, the *focus* of a tectogrammatical (underlying) representation (TR) of a sentence, treated as a dependency tree, can be specified as follows:

if the main verb or some of the nodes which directly depend on it (i.e. some of the "deep cases" and other modifications) are contextually non-bound, then these nodes belong to the focus of the TR;

if a node other than the root of the tree belongs to the focus, then also all nodes subordinated to it belong to the focus;

if the root and also all its daughter nodes are contextually bound (cf. (8) above), then it is necessary to specify the rightmost of the daughter nodes of the root and ask whether some of its own daughter node(s) is (are) non-bound; if so, then these nodes belong to the focus; if not, we again specify the rightmost of the last set of sister nodes and ask whether some of its daughter nodes are non-bound, etc.

We work with two rather strong hypotheses. The first of them claims that the boundary between topic and focus is always placed so that there is a node A such that every node that is less dynamic than A belongs to the topic, and that which is more dynamic, to the focus. The other hypothesis says - cf. (a) in 2.1.3 above - that the hierarchy of CD within focus is determined by what we call systemic ordering, i.e. an ordering of the types of dependency relation which is given by the grammar; on the other hand, within the topic, permutations of the participants and of the free modifications are possible.

An examination of Czech in comparison with English and several other languages has led to the conclusion that the systemic ordering of some of the main participants is identical for many languages, having the form: Actor - Addressee - Objective. As for Instrument, Origin, and Locative, it seems that English differs from Czech in that these three participants follow Objective in English, though they precede it in Czech.

Let us remark that such notions as "fixed" and "free" word order should not be taken as absolute notions, characterizing languages as wholes. As was stressed by Hajičová (1991), each language exhibits a certain freedom and, at the same time, certain regularities in its word order; e.g. in English not only such phenomena as topicalization or left dislocation, but also many kinds of adverbials display possible variation in word order (*from Cambridge to Oxford - to Oxford from Cambridge, by car with a friend - with a friend by car*). The "free" word order is not actually free; primarily, it is determined by the scale of communicative dynamism.

Various questions of TFA are still open for a more detailed and systematic investigation, but a framework has been already built that allows for an explicit description of many of these phenomena. The relevance of TFA for semantics is illustrated in the next two Sections on the examples of presupposition and negation. Here we would like to recall that the semantic relevance of TFA is corroborated by examples of sentences with overt or covert quantification (cf. (9) through (11)):

(9) (a) John talked to few girls about many PROBLEMS.
(b) John talked about many problems to few GIRLS.
(10)(a) English is spoken in the SHETLANDS.
(b) ENGLISH is spoken in the Shetlands.
(11)(a) One smokes in the HALLWAY.
(b) In the hallway one SMOKES.

The scope of operators (quantifiers, negation), which is derived by the interpretation procedure, is thus influenced by TFA so that, e.g., in (9)(a) *few* has the wider scope, whereas in (b) its scope is narrow.

2.2.3 It is the intention of Prague School methodology to look for *operational criteria* that help to decide whether in the given case a token of the defined class is present or not; we are convinced that also for TFA there exist tests that enable us to identify the different phenomena from this domain with a degree of certainty and preciseness similar to that gained e.g. for the identification of the syntactic sentence parts. One of these tests, indicated by Hatcher (1956) and further elaborated especially by Daneš (1970), is based on the assumption that for every sentence the intuitions of the speakers of the given language determine a set of *wh*-questions that can be appropriately answered by the given sentence in different contexts. Thus (with the intonation centre on *a problem*), (12) can answer (13)(a) to (d), while it cannot answer (13)(e) or (f); for the given illustration we disregard such differences as that between (13)(c) and "What did John speak about to that tall girl who sat beside him yesterday?", and also the different possible positions of the intonation centre in the questions.

(12) John talked to his neighbour about a PROBLEM.
(13)(a) What did John do?
(b) What did John talk about to whom?
(c) What did John talk about to his neighbour?
(d) What was John's attitude towards his neighbour?

(e) Who talked to his neighbour about a problem?
(f) To whom did John talk about a problem?

Beside the intuitive consensus concerning the set of questions for which a given sentence can serve as an appropriate answer, it is also necessary to exclude questions that do not fully represent the relevant features of the context in which the given sentence can be appropriately used. Thus, e.g., if (12) is used in a dialogue as an answer to (14), then either the answer (i) brings more information than was required by the question (if *his neighbour* was not activated above the threshold and belongs to the focus of the answer), or (ii) a part of the activated (salient) information was not mentioned in the question since recalling it would be superfluous, but in the answer the words *his neighbour* refer (in a redundant way) to this piece of information (they belong to the topic of the answer).

(14) What did John talk about yesterday?

This answer may appear quite useful in the given point of the dialogue, but it is not an immediate answer fully fitting the given question. The usefulness of such an answer is due to the pragmatic conditions and the flexibility of a dialogue, rather than to the linguistic properties of the two sentences involved.

It is possible to object that in fluent dialogues the exchange of 'full' questions and 'immediate' answers is rather rare. However, we are not analyzing the structure of the dialogue now; we are just looking for a testable criterion that could help us to identify the boundary between topic and focus (and, as far as this is possible, also the degrees of CD). If the intuition of the speakers coincides as to the properties of such questions and answers, then the test can be used with good results.

The following rules understood as the basis of the question test may be restated here:

(a) if the set of all those questions for which the given sentence can serve as an 'immediate' answer (called "the set of relevant questions" in the following) fulfills the condition, for some phrases A and B included in the given sentence, that (the referent of) A is (referred to by a phrase) included in every question from the set in which B is included, and also in such a question (from the set) that does not include B, then in (all TR's of) the given sentence the (source of the) phrase A is less dynamic than (the source of the) phrase B;

(b) if A (from the given sentence) occurs in no element of the set of relevant questions, it is the focus proper of the given sentence;

(c) if A (from the given sentence) occurs in every element of the set of relevant questions, then it belongs to the topic of the given sentence;

(d) if (a) is met by A and B, but either A or B breaks (b) and also (c), then the sentence is ambiguous in that the phrase breaking these two conditions belongs to its topic in some of its TR's and to its focus in some other;

(e) if there is a pair of phrases, A, B, in the given sentence such that A and B break (a) and neither A nor B meets (c), then the sentence is ambiguous not only with respect to the position of the boundary between topic and focus - cf. (d) and Chomsky's "range of permissable focus" - but also in that A is less dynamic than B in some of its TR's, being more dynamic than B in some other; at most in one of these two cases both A and B belong to the focus.

If these conditions are applied to our example (12) above, (a) is fulfilled by the pairs *John* and *talked*, *John* and (*to his*) *neighbour*, since (*about a*) *problem* is not included in any relevant question; (a) is also fulfilled by every pair containing *problem* as B and any other constituent (the verb or one of its participants) as A; thus, in the scale (or linear ordering) of CD of all TR's of (12) *John* precedes *talk* as well as *neighbour*, while each of the three precedes *problem*. The condition of (b) is met by *problem*, which is the focus proper of all TR's of (12), while *John* belongs to the topic in all TR's since it fulfills (c). Since the condition of (d) is met by the pairs in which A and B are assigned the values of *John* and *neighbour*, respectively, or *John* and *talk* (and, trivially, also *neighbour* and *problem*, as well as *talk* and *problem*), we may state that there are TR's corresponding to (12) in which

(i) *talk* belongs to the topic,
(ii) *talk* belongs to the focus,
(iii) *neighbour* belongs to the topic,
(iv) *neighbour* belongs to the focus.

If *talk* is substituted for A and *neighbour* for B (or vice versa), point (e) is fulfilled, so that there are such TR's in which *neighbour* is more dynamic than *talk* as well as others in which *neighbour* is less dynamic, whereas only in the former case may both the phrases belong to focus.

This shows that to a certain degree the question test is useful not only for drawing the boundary between topic and focus (or, more exactly, between the contextually bound and non-bound parts of the upper bundle of a TR of a given sentence, see below), but also for identifying the degrees of CD; the elements that belong to the topic only in some of the TR's of the sentence are more dynamic than those belonging to the topic in all TR's, but less dynamic than the (single, as the examination of hundreds of examples from different European languages suggests) element that in all TR's belongs to the focus (and thus constitutes the focus proper).

The operative use of the question test gives definite results; in those cases in which it yields more than one possible topic/focus structure for a single sentence, the sentence is ambiguous, so that the test should yield all the resulting TR's, and this is precisely what the question test does. The solution of the ambiguities is a quite different task, which requires the knowledge of the relevant points of the situation in which the ambiguous sentence was used; for "human" application this knowledge may be reduced to the choice of one of the "relevant questions", but this, of course, does not help in the case of an automatic analysis.

The question test appears to give results very similar to the scale called 'range of permissible focus' by Chomsky (1968); some of the drawbacks of his formulations were discussed by Sgall and Hajičová (1977). Certainly the question test is also connected with certain difficulties. First of all, it cannot be applied directly to sentences other than positive declarative ones; negative, interrogative and other sentences have to be analyzed as parallel to their positive declarative counterparts, which is relatively easy with negative sentences, though not with questions (see Hajičová, 1976, and Section 2.4.1 below). Second, it is not always possible to apply the test to embedded elements in the analyzed sentence.

It is not quite certain whether, e.g., (15) is an immediate answer (in the above sense) to (16), and not only to (17):

(15) His house has been destroyed by a TORNADO.
(16) What happened to John?
(17) What happened to John's house?

2.3 Focus and Presupposition

Though the fashionable wave of using (and misusing) the notion of *presupposition* in linguistic writings has crested in the beginning of the seventies (see Karttunen and Peters, 1977), the notion still remains one of the widely discussed issues in present-day linguistic writings. In this Section I would like to return to my older investigations which led me to introduce the

trichotomy of 'meaning proper', presupposition and allegation (Section 2.3.1), and re-examine the appropriateness of the notion of allegation from the point of view of several, more recent writings on presupposition (Section 2.3.2), adding then further remarks on the relevant issues.

2.3.1 First, the fundamental assumptions should be briefly summarized (cf. already Hajičová, 1971): three kinds of entailment should be distinguished, which can be specified for declarative sentences in the following way:

(i) meaning proper: A is a (part of the) meaning proper of B, if B entails A and not-B entails not-A;[19]

(ii) presupposition: A is a presupposition of B, if B entails A and not-B entails A;

(iii) allegation: A is an allegation of B, if B entails A and not-B entails neither A nor not-A.

The three notions can be preliminarily exemplified by the sentences (18) to (24).

(18) Since John was ill, we won the MATCH.
(19) Since John was ill, we didn't win the MATCH.
(20) Harry caused our VICTORY.
(21) Harry didn't cause our VICTORY.
(22) We won the MATCH.
(23) We didn't win the MATCH.
(24) John was ILL.
(25) ... He tried hard, but it was Johnny who took over all the initiative, was the best player of the team and helped most of all to get back the Cup.
(26) ... This time, unfortunately, we lost the game.

The assertion (22) is a part of the *meaning proper* of (18), since it is entailed by (18) and (23) is entailed by (19); (24) is a *presupposition* of (18), since it

[19] Our understanding of not-A and not-B, i.e. the linguistic negation, is discussed in 2.4.1. It is not identical with the logicians' formulation "it is not true that...", since we are convinced that the latter formulation disguises the linguistic structuring of negative sentences, esp. the distinction between sentences with and without a topic (categorical and thetic judgements). Moreover, it also disguises the difference between falsity and inappropriate use: A sentence S can be used, in general, as true, false, or in an inappropriate way: thus, *The sentence S is not true* as well as *It is not true that S* both just state that S is not true in the given context; they both may hold if its use with respect to the given world and reference assignment was false or inappropriate.

is entailed both by (18) and by (19); (22) is an *allegation* of (20), because it is entailed by (20) and neither entailed nor denied by (21), as the two possible continuations of (21) show, which we exemplify here by (25) and (26). This is to say that in the case of allegation, what is entailed by the affirmative sentence may, but need not take place if the corresponding negative sentence is true.

Also some of the verbs often characterized as connected with presuppositions appear not to display such properties. Thus, *to open* seems to be connected with an allegation rather than with a genuine presupposition: *John didn't open the door* can be followed by *It was already open when he came*; similarly, *John doesn't accuse Paul of the delay in the publication of the paper* can be followed by *In fact John doesn't regard the delay as bad, because now there is still time to make corrections*, and such a sentence as *John doesn't criticize Paul for the delay in the publication of the paper* can be followed by *He doesn't regard Paul as responsible for the delay*. This shows that *accuse* and *criticize* too can be characterized as determining allegations, contrary to Fillmore's (1969) assumption that these verbs are connected with presuppositions.[20]

2.3.2 A closer look at the examples analyzed reveals interesting relationships between the classification of entailment and TFA. If the NP *our victory* is (a part of) the topic with such a verb as *cause*, then it does trigger a presupposition: (22) is a presupposition of (27), since it is entailed both by (27) and by (28); (28) can be followed by (25), not by (26).

(27) Our victory was caused by HARRY.
(28) Our victory wasn't caused by HARRY.

We have offered an explanation in terms of the scope of negation: as our investigations in the framework of FGD have shown (Hajičová, 1973), in the unmarked case the scope of negation is identical with the focus of the sentence[21] and no presupposition is triggered by *our victory*, in such a

[20] Fillmore and others who distinguish only 'meaning proper' ('assertion') and presupposition do not have any possibility to discuss more articulated questions than whether a given verb triggers a certain presupposition.

[21] Our understanding of 'scope of negation' differs from Kempson's (1977:133f), discussing the relationships between the component parts of a single lexical item. While it is possible to agree with her that, e.g., *It wasn't a woman that came to the door* is indistinct, rather than ambiguous, as far as the negated part of the meaning of *woman* is concerned, nothing follows from this for the

position. Thus in (20) the noun group is connected just with an allegation; see also a logical approach to allegation in Materna (1978).

2.3.3 Evidently, the current understanding of the notion of presupposition covers a heterogeneous collection of phenomena. Attempts to apply the negation test consistently, and to subject the examples of 'obvious' presupposition-carrying structures to a detailed empirical analysis have caused serious doubts about the appropriateness of introducing presuppositions into linguistic (as well as logical) theory. Several ways out have been suggested: on the one hand, it was proposed to recognize a certain 'gradience' in entailment (Bolinger, 1976), and on the other hand, to broaden the notion of presupposition to cover all presupposition-like phenomena even if they do not comply with current definitions (Cooper, 1974). It was shown, however, that this collection should be divided into categories one of which at least, since belonging to conventional implicature, can meet the original, strict requirements (Karttunen and Peters, 1977, 1979).

Others proposed an entailment analysis within a pragmatic theory of preferred interpretations (Wilson, 1975), or refused to include the concept of presupposition in the semantics of natural language, accounting instead for the phenomena in question with a Gricean pragmatic framework (Kempson, 1975). In his revealing review of Kempson (1975), Cresswell (1978) points out that the problem of presupposition can be transposed to that of the scope of negation. But this does not solve the problem in its entirety: as Hausser (1976) correctly has pointed out, a Russellian analysis (assuming the ambiguity of *The present king of France is not bald* on the narrow scope and wide scope negation readings) runs into difficulties for two reasons:

(a) the above sentence is intuitively unambiguous;

and

(b) the analysis cannot be extended to other instances of presuppositions.

As for (a), a topic-focus analysis of the sentence offers a suitable explanation; in its highly preferred reading, this sentence is not without a topic (since the subject position is occupied by a definite NP); as for (b) it seems that these other instances would include, e.g., factives.

We have followed a similar line of thinking when arguing for the necessity of the recognition of allegation in our papers mentioned above; in addition, we attempted there to specify the scope of negation in its close relation to topic-focus articulation as briefly outlined above. In our

scope of negation in the usual sense (with respect to the structure of the sentence).

formulations, not-S refers to the negation of the sentence S in the sense of the negation of the focus of S. With sentences having a topic, this can be compared with what logicians call 'internal negation', viz. negation of merely some part of the sentence. In terms of our understanding of the relation between topic and focus on the one hand and of the scope of negation on the other, external negation is the case of negation of a sentence without topic. Informally speaking, sentences without a topic may answer a very general question such as *What's the matter?*, *What has happened?*, *What's the case?*, and they lack an indexical or other lexical item referring broadly to the given situation (setting). Thus, *No RAIN is falling* and *A stranger fell DOWN* lack a topic, while *Yesterday it RAINED* and *There was a STRANGER here* have one (*yesterday* and *here*, respectively).

In the discussion of presupposition, the question of ambiguity vs. non-ambiguity of negative sentences has emerged. Kempson (1979) does not recognize any empirical or methodological basis for the ambiguity thesis, while Katz (1979) assumes that negative sentences are inherently ambiguous between a presuppositional and a non-presuppositional reading. Dinsmore (1981:339), criticizing Atlas (1979), who postulates a more abstract entity for the meaning of negation becoming external negation in some contexts and internal negation in others, duly remarks that people "most always mean what they say". This, however, should be extended in the sense that people also mean to negate what they negate, thus corroborating the ambiguity thesis (cf. Section 2.4 below).

Interestingly, many of the writings quoted above hint at the necessity to recognize a concept similar to that of allegation. Many such insights can be found especially in Wilson (1975), who speaks about 'alleged presuppositions' (p. 25) and analyzes such examples as *I didn't clean the bathroom. I cleaned the kitchen* as neither suggesting that the bathroom was dirty (usually considered as the proper analysis of the presuppositions of 'clean'), nor explicitly stating that it was not (Wilson, 1975:84, ex. (41)). In addition, some studies take the close connection between the kind of entailment and the articulation of the sentence into topic and focus into account. Thus, it is by now widely accepted (and our own conclusions in Hajičová, 1971, should be amended accordingly) that in the case of definite NPs, the failure of the 'existential' (in our terms, referential) entailment carried by such a definite element makes the statement meaningless (i.e., it causes a truth value gap, it constitutes a presupposition failure) if the NP in question is in the topic part of the sentence. Note that those who rely on English only and take it as a prototype of natural language, speak mistakenly about the subject position of the NP.

On the other hand, if the definite NP is a part of the focus, the failure of the entailment leads to the falsity of the whole statement (see, e.g., Cooper's, 1974:37, example *He spent the morning interviewing the king of France*; cf. also Keenan, 1976:318; Lyons, 1977:601; Sgall, 1980, and Fodor's, 1979, discussion of the pair *The king of France visited the exhibition* and *The exhibition was visited by the king of France*). Also Wilson and Sperber's (1979) "ordered entailments" come rather close to our suggestion to study presupposition in close connection with the topic-focus articulation (especially with the hierarchy of communicative dynamism). In his discussion of Wilson and Sperber's examples, Dinsmore (1981:346) seems to be mistaken when he assumes that sentence stress (i.e. the position of the intonation centre) is not decisive: *Susan REGRETS that she left* presupposes *Susan left*, but when the intonation centre is shifted to the final element (*Susan regrets that she LEFT*) this entailment becomes an allegation (the negative counterpart *Susan does not regret that she LEFT* may but need not imply that Susan left). In effect, Dinsmore's own claim that presupposition ties in with given information (1981:361) as well as Kuroda's (1979) definition of presuppositions by means of 'old or given information' both point to the necessity of studying presuppositions in a close relationship with the issues of topic and focus.

2.3.4 One of the first to make a distinction between 'logical' and 'pragmatic' presuppositions was Keenan (1971), who takes the latter to be determined by culturally defined conditions of the context, having nothing to do with the speaker's beliefs about the truth or falsity of the entailed expression(s). In fact, it may have been misleading to call them 'presuppositions' in the first place. Thus we disagree with Stalnaker (1974), who claims that "the semantic and pragmatic notions of presupposition provide two alternative accounts of the same linguistic phenomenon".[22] Rather, we are dealing with two different, though overlapping sets of phenomena, one having an immediate impact on linguistic meaning, the other having more in common with Gricean conversational principles and implicatures.[23] As

[22] The former are defined in terms of van Fraassen's (1968) definition, the latter by means of conversational acceptability of the utterance P, when the speaker of P assumes Q and believes his or her audience to assume Q as well (Stalnaker, 1974:222-223; cf. Schwarz, 1977:247). Groenendijk and Stokhof (1978) work with a modified definition of pragmatic presuppositions (the speaker's belief being a necessary feature) and conclude that every semantic presupposition has its pragmatic counterpart, though the inverse does not always hold.

[23] See Sgall's (1975) discussion of Keenan's pragmatic presuppositions.

Verschueren (1978) notes, there are pragmatic "presuppositions" that "disappear" under negation; cf. also Schwarz (1979). A plausible explanation concerning this point is offered by Hausser (1976:258), who argues that it is *sentences* which have presuppositions (although in this case we would prefer 'sense of a sentence', i.e. an underlying representation plus the specification of the reference, to 'sentence'). While speakers and hearers both may have their own assumptions, speakers must reckon with the semantic properties of the sentence (including its semantic presuppositions) if they want to use a sentence successfully, and they must take the hearer's assumptions into account as well.

Let us only note in this connection that probably every genuine presupposition (i.e., 'logical' or 'semantic') has also its pragmatic aspects, representing necessary conditions on smooth linguistic performance (cf. Verschueren, 1978:109). Other phenomena, such as the distinction between *tu* and *vous* in French, may show similar pragmatic aspects. However, the latter seem to belong to the domain of conversational implicatures, felicity conditions, and similar regularities of communicative competence, rather than to linguistic competence itself. The pragmatic aspects of 'logical' or 'semantic' presuppositions both derive from the fact that it is the *sense of a sentence* (see Section 1.2.3 above) that is connected with a certain presupposition. In other words, it is necessary to know the reference assignment of a given occurrence of the sentence to be able to check whether or not its presuppositions are met.

2.3.5 Even if it can be shown that many assumed instances of presuppositions can be explained either by appealing to the scope of negation as not including the topic of the sentence, or to the Gricean pragmatic framework, there still remain presuppositions that are carried by the complements of factive verbs (e.g. *I know that...*), and which admittedly are connected with a kind of entailment that is different from that of 'meaning proper' and allegation.

Careful investigations of the so-called factive verbs and of the entailments connected with their complements in the position in the topic and in the focus of the sentence point to a set of factive verbs that probably is smaller than formerly assumed. In the case of *to regret*, *to be glad*, for instance, the changing around of topic and focus reveals their object clauses to be presupposed only when in the topic, whereas in the focus position they are connected with allegations.

(29) He regretted that his friends came to SEE him.
(30) He didn't regret that his friends came to SEE him.

(31) That his friends came to see him he didn't REGRET.
(32) You're mistaken; his friends didn't come.
(33) His bad mood was due to the fact that the weather didn't allow him to plan a skiing weekend this time. As for his friends, they all came for the party and it was a nice party, you can believe me.
(34) His bad mood was due to the fact that the weather didn't allow him to plan a skiing weekend this time. As for his friends, they had to stay at home since they had a sick child.

If the 'fact' that the friends came to see him were presupposed, then reaction (32) would be appropriate for all the sentences (29) to (31), since it would point to a presupposition failure. However, in the case of (30), such a reaction makes the dialogue incoherent, whereas (30) can be coherently followed both by (33) and by (34).

Cresswell's doubts about the feasibility to subsume the problem of factives under the analysis of the anaphorical use of the definite article (as proposed by Kempson, 1975) are thus more than justified (1978:443). He discusses cases similar to (35):

(35) John doesn't know (the fact) that he lost a sixpence.

It would be rather difficult to show that the definite article in '*the* fact that ...' really plays the anaphoric role that Kempson assigns to it as a key feature in her analysis. Rather, *the fact* refers to the following *that*-clause and this clause belongs primarily to the focus of the sentence in question. The object of such verbs as *to know* belongs to the topic only in specific contexts, such as, e.g., *John lost a whole fortune but he does not KNOW yet that his financial situation has become that bad.*

2.3.6 We are convinced that the above lends support to the necessity to consider presupposition as a specific type of entailment. A number of authors speak of entailment as such, implying that there is no need to differentiate between its different kinds. However, even if - for the sake of the argument - we accept the analysis of a sentence as a conjunction of propositions, we cannot overlook the fact that the different elements in such a conjunction have a different status. Thus, for example, if we take (36) as a conjunction of several propositions, among others of (37)(a) and (b), the respective negative reactions (38)(a) and (b) differ from each other.

(36) John knows that Jane married Jim.

(37)(a) John knows the fact.
(b) Jane married Jim.
(38)(a) No, he doesn't know.
(b) Oh, no, you are wrong, she didn't.

Replies such as (38)(b), or those starting with *Oh no, you see,... How could it be so?* indicate that there is a certain discontinuity in the dialogue. The speaker makes clear that one of the tacit assumptions made by the other participant does not hold in the given situation. It is, of course, also possible to just say *No, she did not*, but such a simple continuation is by far not as natural as (38)(b). Thus, such replies as (38)(b) can be regarded as typical for the case of presupposition *failure*, i.e. where a conventional implicature is not met at the given point of discourse. More precisely, a presupposition failure obtains in those cases in which such a reply may follow either the affirmative sentence or its negation. On the other hand, when only the affirmative sentence allows for this continuation, we may be faced with an allegation.

Similar consideration may hold for Kempson's (1975) example, here (39), with a reply such as (39)(a), which evidently is different from (39)(b): only the latter entails the truth of the fact that Edward had been unfaithful to Margaret.

(39) Sue didn't realize that Edward had been unfaithful to Margaret.
(39)(a) You must be wrong. How could she have! I know Edward never has been unfaithful to her!
(39)(b) Oh no, on the contrary, she did realize it!

While (39)(a) suggests a presupposition failure, (39)(b) indicates the negative truth value for (39). For the latter, the initial *On the contrary* may be taken as a test confirming this. For sentences conveying partially true information (e.g., *The French flag is red and blue*) falsifying reactions such as *But not only!* are typical.

2.3.7 The need to distinguish presupposition from other kinds of entailment is thus confirmed by:

(i) distinguishing allegation from presupposition,

and

(ii) working in a systematic way with the topic-focus articulation.

It should be recalled that in cases such as *to open*, or *to accuse* vs. *to criticize* an allegation rather than a presupposition is at stake, while, on the other hand, such semantic units as *to cause*, *to regret*, or definite NPs are

connected with presuppositions only if the 'triggering' elements belong to the topic (belonging to the focus, they 'trigger' an allegation only; cf. (20) vs. (27), (30) vs. (31) above, and so on). Only if these cases are duly distinguished, it is possible to conclude in a convincing way that there exists a class of genuine presuppositions (i.e., conventional implicatures meeting the conditions of the definition reproduced as (ii) in Section 2.3.1). It is, then, not surprising that this class does not include all the cases originally subsumed under that heading; even more relevant, the class is not empty.

As we have seen above, definite NPs (or at least some of them) are connected with referential presuppositions if they belong to the topic rather than to the focus. It remains to be tested empirically whether also NPs with the delimiting feature 'Specific' do not likewise trigger a presupposition, if they belong to the topic. Such examples as (40) seem to corroborate this view:

(40) It was PAUL who saw a white crow yesterday.
(41) Paul saw a white CROW yesterday.

Contrary to (41), which contains the relevant NP in the focus, (40) mentions it as contextually bound, as if white crows were 'given' by the preceding co-text or situation, i.e., as one of the salient items in the stock of shared knowledge.[24] We assume that (42) is natural if it follows (40), while (43) is a smooth continuation of (41) but not vice versa. It follows then that the topic position is a condition for a presupposition to be present also in the case of at least some specifying NPs; not only definite NPs are concerned.

(42) Oh no, you are wrong, no one has ever seen a white crow.
(43) No, on the contrary, he saw only black ones.

Also, the fact that such words as *even* or *also* are connected with genuine presuppositions (Karttunen and Peters, 1977) seems to indicate the specific function of those adverbs in the topic-focus articulation. In *They saw even JANE* or *They met also PAUL*, these adverbs mark the following nouns as being the only items included in the focus, with the verbs and their subjects then belonging to the topic, so that such sentences can be used appropriately

[24] Even in examples such as these, what is presupposed here is not exactly the existence of white crows in (our image of) the actual world. Thus, sentence (40) may be preceded, e.g., by *Two of the patients had dreams about fantastic creatures during the last few days*, and followed by *A flying horse was seen by JIM this time*.

only in those contexts where one of the salient items is that 'they' saw (met) someone.

As for proper names, however, it seems that even if included in the focus they are connected with a genuine referential presupposition: both *John has (not) met MARILYN* and *John has (not) MET Marilyn* entail that there is a person (in the relevant part of the universe of discourse, not necessarily in the real world) who is referred to as Marilyn. A continuation such as *I don't know who you mean by Marilyn* can be understood as an instance of presupposition failure.

Returning back to such adverbs as *even* or *also*, it should be noted that they, similarly as negation and as sentence adverbials, behave as 'focalizers' (see Koktová, 1986; Hajičová and Sgall, 1991, and the writings quoted there, esp. Jacobs, 1983, and his 'Gradpartikeln'). Focalizers, which have foci of their own, often occupy a boundary position between topic and focus, but also can be included in the topic or constitute the single element of the focus, in which case their scope coincides with the rest of the sentence (with the topic). If the boundary position is not occupied by an overt focalizer, then it is possible to accept the presence of the affirmative modality as a virtual focalizer (cf. Zemb, 1987). Two approaches may be formulated as more or less equivalent:

(i) a sentence without a focalizer can be taken as the basic (prototypical) case, and the position on the boundary between topic and focus can be regarded as the primary position of a focalizer; the other possible positions of focalizers can then be described as specific secondary cases (the syntactic conditions and the semantic interpretation of which have to be specified along the lines discussed recently by M. Rooth, M. Krifka, and others); these secondary cases probably occur only in rather limited classes of contexts;

(ii) the description can start from the general case (taking into account the different positions of focalizers) and a sentence without any overt focalizers can be handled then as displaying a 'zero' focalizer, i.e. the assertive modality of the verb; however, it would then be necessary to admit the existence of such a zero focalizer also in such sentences where an overt focalizer is included in the topic part of the sentence, e.g. (*Who did only John see?*) *Only John saw MARY*; it would not be quite clear in such a case whether a zero focalizer is not present when a focalizer occupies the position of the boundary between topic and focus (why should not the affirmative modality play the role of a focalizer in *Jack readily helped his FATHER*, if it plays this role in *Jack helped his FATHER*? However, in *Jack helped even his FATHER* the modality, together with the lexical meaning of the verb, is included in the topic.).

Since the focalizer can belong either to the topic or to the focus, it seems preferable to understand its primary position (on the boundary) as that of the least dynamic element of the focus, rather than as a third part of the sentence (between its topic and focus). This should not be understood as contradicting the semantic analysis using tripartite structures (as currently applied by B. Partee and her school); with this analysis, the operator can be included in a noun group. Furthermore, the difference between the linguistic structure of the sentence as the input of semantic interpretation and the output (or some intermediate stages) of the interpretation should not be neglected.

2.4 Focus and Negation

After a discussion of different shapes of the scope of negation (2.4.1) and of the alleged vagueness of this operator (2.4.2 and 2.4.3), we present an analysis of the issue of presuppositions of questions (2.4.4 and 2.4.5).

2.4.1 In the stimulative analysis of negation by Vachek (1947), we can find several pioneering observations concerning the relationship between the meaning of negative sentences and functional sentence perspective (topic-focus articulation, TFA, in our terminology). Vachek's analysis, supported by some more recent treatments of negation, led us to examine systematically the relevance of TFA for the interpretation of the scope of negation in Czech and English sentences, with the conclusion (Hajičová, 1973) that linguistic negation can be understood as an operator the scope of which should be analyzed as follows:[25]

(a) in the primary case the scope of negation is identical with the focus; two situations can be distinguished then:

(aa) the verb belongs to the focus and is negated, as in the primary reading of (44), where only the subject (functioning as topic) is outside the scope of negation;

(ab) the verb belongs to the topic, so that it is not negated, see (45);

(b) in the secondary case a verb in the topic constitutes itself the scope of negation, see (46).

[25] These three readings might be completed by a fourth one, namely that in which the negative polarity would be the only element in focus (see Koktová, 1990); in our approach here this case is considered to be a special instance of (aa) with (negated) verb being the only element in the focus part of the sentence.

(44) Harry didn't bring any new BOOKS. (He stayed home tonight).
(45) Harry didn't bring any new BOOKS. (...He brought only a couple of journals).
(46) Harry didn't bring any new books since he was ILL (when answering e.g. "Why didn't Harry bring any new books?")

2.4.2 It should be noted that only case (a) can be understood as a negated sentence, i.e. as not-A in the sense of Section 2.3.1 above, since case (b) comes closer to lexical than to sentential negation. Our analysis of negation has led us to claim that a sentence the topic-focus structure of which allows for several different positions of the operator of negation (and thus for the assignment of different scopes) is an ambiguous sentence with as many meanings as many scopes can be assigned to it. We are not alone in regarding negative sentences as ambiguous; a number of arguments have been represented by several linguists supporting this claim (see, e.g., Chomsky, 1968; Lakoff, 1970; Jackendoff, 1972; for more recent treatments, cf., e.g., Jacobs, 1982; Lieb, 1983; Sgall, Hajičová and Panevová, 1986).

Contrary to these views, Kempson (1975, 1977) argues that negative sentences are unambiguous. She supports her claim by the verb phrase pro-form test. This test is based on the assumption that the use of a verb phrase pro-form expression (such as *do so*, *so did*, or *did/had/will/is too*), referring anaphorically back to the action that has already been specified, demands identity of meaning. Thus, e.g., (47) is predicted to be two-ways ambiguous, since the expression *did so too* must refer either to a situation that Bill saw the duck which belonged to her (i.e. one possible reading of the first sentence in the conjunction), or to a situation that Bill saw her quickly lower her head (i.e. another possible reading of the first clause).

(47) Johny saw her duck and Bill did so too.

On the other hand, the same test shows that the distinction between an intentional action of rolling down a hill and an unintentional one (e.g., if somebody is pushed and he then rolls down) is not a distinction between two meanings of the first sentence in (48), see Sgall, Hajičová and Panevová (1986, Ch.2).

(48) Mike was rolling down the hill, and so was Bob.

The speaker can use (48) with no contradiction involved in case when Bob rolled down for fun and some other boy pushed Bill so that Bill fell down and rolled down the hill unintentionally.

Applying this test to negative sentences (49) and (50) in the context (49)(a) and (50)(a), respectively, Kempson (1977:134, ex.(10) and (11)) concludes that "at least in general, negative sentences are not ambiguous with respect to variations in the scope of negation".

(49) The professor didn't accuse her of taking drugs.
(49)(a) The professor didn't accuse her of taking drugs and her tutor didn't do so either. The professor didn't say anything at all because he didn't think she was taking them and her tutor, who also takes them, merely suggested that she should be more careful about it in future.
(50) The chairman didn't sell any shares to the new firm.
(50)(a) The chairman didn't sell any shares to the new firm and the secretary didn't do so either. I know the chairman didn't because he specifically told me that he had given them some as a free gift, and the secretary didn't because he didn't have any to sell.

According to Kempson, the interpretation of (49) varies across two entailments; (i) the referent of the subject of *accuse* assumes that the action involved was bad, and (ii) the referent of the subject of *accuse* states that the person accused was responsible for the action in question. In a similar vein, the denial of the selling of shares in (50) may imply either (i) that no transaction of money took place (it was a gift), or (ii) that there was no exchange of any sort (either of good or money). The fact that in the continuation of both (49) and (50) the pro-form can refer to both (i) and (ii) interpretations simultaneously, is taken as a confirmation of postulating a single semantic representation for such sentences as (49) and (50), i.e. of regarding them as unambiguous (although indistinct, vague).

2.4.3 Let us take a closer look at Kempson's examples through the perspective of our treatment of negation as summarized in Sect. 2.4.1 above. In (49), the "natural continuation" as exemplified by the context following this sentence indicates that (on this reading at least) *the professor* and *her* belongs to the topic and the rest of the sentence to the focus, so that the scope of negation ranges over the verb and the cause of accusation (see the case (a) in Sect. 2.4.1). As for the decomposition of the lexical meaning of *accuse* (in which Kempson follows Fillmore, 1969), a detailed analysis of this and similar

examples in Hajičová (1971) led us to introduce - besides meaning proper and presupposition - a third type of entailment, namely *allegation* as recalled in Section 2.3 above, where we concluded that the component of the lexical meaning of *accuse* denoted above as (i) does not belong to the presuppositions of *accuse*, quoting (52) as a possible continuation of (51):

(51) John does not accuse Paul of the delay in the publication of his paper.
(52) In fact, John does not regard the delay as bad, because now there is still time to make corrections.

The entailment "John regards the delay as bad" is thus an allegation, which leaves open both possibilities under negation (the negation of *accuse* in (51) entails neither that John regarded nor that he did not regard the delay as bad).

As for (50), the situation is similar, but a little more complicated by the fact that in the reading documented by the context in (50)(a) the sentence should probably be pronounced with the intonation centre on *shares* rather than on *firm*. Thus the Addressee *to the new firm* as well as the Actor *the chairman* belong both to the topic of this sentence, the focus (as well as the scope of negation) ranging over the verb and the Objective: *sell shares*. Again, the entailments triggered by this part of the sentence represent an allegation, so that the two continuations in (50)(a) do not lead to contradiction.

Let us now look at example (53):

(53) Tom doesn't sleep because he is tired.
(54) Tom doesn't sleep because he is tired.
(After: Why doesn't Jane's son sleep?)
(55) Tom doesn't sleep because he is tired, but because he likes to take a nap every afternoon (= he sleeps).
(56) Tom doesn't sleep because he is tired and so doesn't do Jane.
(57) Tom doesn't because he cannot sleep when he is too tired, and Jane doesn't because she likes to take a nap every afternoon.
(58) Tom doesn't because he cannot sleep when he is too tired, and Jane *does* (sic!) because she likes to take a nap every afternoon.

Assuming that in the relevant readings of (53) the verb can either be in the focus or not, then the scope of negation ranges over the whole focus (the case (aa) in Sect 2.4.1), and if the verb is in the topic, it is out of the scope of negation (case (ab) and ex. (55)), or both the negation and the verb are in

the topic and the rightmost-side boundary of the scope coincides with the boundary between topic and focus (case (b) and ex. (54)).

As the impossibility of (57) following (56) shows, the pro-verb *do so* cannot be used to refer to the situation identified by (54) and simultaneously to that identified by (55). On the other hand, (58) reflects the difference in scope, which is rendered by the use of "doesn't" and "does" for the (b) and (ab) readings, respectively; however, (58) contradicts the second conjunct of (56). It follows that in (56) the two readings cannot be combined; they constitute two different underlying structures.

The consequence should be drawn from this observation that either the *do so* test is not an appropriate vehicle for testing ambiguity, or that negated sentences cannot be in general interpreted as unambiguous. We subscribe to the latter view, which also makes it possible to state generalizations for the interpretation of affirmative and negative sentences in relation to their topic-focus articulation. However, as we have seen, ambiguity is not brought in with negation; it is proper already to the positive counterparts: it is the ambiguity of the boundary between topic and focus, which in positive sentences is responsible for differences concerning presuppositions.

2.4.4 To specify what is a presupposition of a question (or, to be more precise, of an interrogative sentence) is a difficult problem because the test of negation cannot be used directly for this purpose. Let us first discuss from this point of view some aspects of *wh*-questions.

An integrated formal analysis taking into account both logical and linguistic aspects of *wh*-questions was given by Keenan and Hull (1973), who define presuppositions of questions as logical consequences of every pair of the given question and one of its logical answers. According to their definition an L-sentence (i.e. roughly a logical form of a sentence) S "is a logical presupposition of a question Q just in case, for every answer A to Q, S is a logical consequence of the pair (Q,A)", where A is the phrase which with other approaches would be considered the (non-omissible) focus of the answer.

With such a specification of a presupposition of a question based on the logical answers to the question it is not quite clear whether a negative pronoun might be considered a logical answer to a *wh*-question: If one supposes that *nobody* is a possible answer to (59) then using the above mentioned framework we see that (60) is not presupposed by the given question, since (60) is not a logical consequence of the pair (*Who came? Nobody.*); only if one assumes a priori that *nobody* does not belong to appropriate answers to the given question, then (60) is presupposed by the question.

(59) Who came?
(60) Somebody came.

The view that (60) is a presupposition of (59) is shared by many of those who discuss this problem (see Katz and Postal, 1964; Karttunen, 1978; Bolinger, 1978a, 1978b; Hintikka, 1978, but cf. below).

A more differentiated view is held by Kiefer (1977); he makes a distinction between a presupposition of a question (which must be shared by the answer) and a background assumption (which may but need not be shared by the answer). He exemplifies this distinction on (61) to (63).

(61) Who has studied water pollution?
(62) There is no water pollution.
(63) Nobody.

(62) is a negation of (one of) the presupposition(s) of the question (61) (one can speak here about "presupposition failure": the response might have started with the words "You're mistaken, there is no water pollution"). On the other hand, (63) only indicates that the hearer does not share the background assumption of the speaker ("somebody has studied water pollution").

Joshi (in his lecture in Prague, 1979) proposed to make an interesting distinction between presuppositions and presumptions of a question: P is a presupposition of Q, if for all direct answers A_i of Q, $A_i \rightarrow P$ and $\neg A_i \rightarrow P$. P is a presumption of Q, if for all direct answers A_i except one, say A_j, $A_i \rightarrow P$, $\neg A_i \rightarrow P$, $i \neq j$. This is to say that in case P is a presupposition of Q, then one cannot answer Q by a negative pronoun; see (64) and (65).

(64) When did John take CSE 110?
(65) John took CSE 110. (= presupposition)

If, on the other hand, P is just a presumption of Q, such an answer is possible; see (66) to (68).

(66) Which faculty members teach CSE?
(67) Faculty members teach CSE. (= presumption)
(68) Noone.

In the latter case Joshi states the questioner may add "if any", which admits the negative answer (68).

We tried to show (Hajičová, 1976) that the intuitive acceptability of a negative answer such as (71) to *wh*-questions depends on the way in which the question is pronounced: if the intonation centre is on the *wh*-element (as in (70)), then (71) is highly inappropriate, and almost breaks down the dialogue (the speaker might have added "You're mistaken, noone came there"), while if the intonation centre is at the end of the question (as in (69)), such an answer is quite acceptable, cf. Stechow (1980).

(69) Who came to the MEETING?
(70) WHO came to the meeting? (= WHO was it who came to the meeting?)
(71) Nobody.

With (70) one expects to be given a non-empty list of persons who attended the meeting, which is not the case with (69).

If these intuitions are true, then again the presuppositions of questions must be studied in close connection with the topic-focus articulation of questions. The intonation centre on the *wh*-element shows that the rest of the question belongs to the topic part; if the intonation centre lies on the last element of the question, then (at least) this element belongs to the focus (see Hajičová, 1976, for the topic-focus distinction in questions).

It should be mentioned in this connection that Bolinger's (1978b) analysis of the *wh*-questions is based on very similar considerations; if the *wh*-element is in the final position, then only the *wh*-element is assumed to be in the comment (focus), the whole rest of the question belonging to the topic, as in (72).

(72)(a) You gave the book to WHOM?
(b) WHOM did you give the book to?

In this particular paper, Bolinger does not take into consideration the possibility of the front position of the *wh*-word with the shift of the intonation centre on it, thus marking it also as the comment (focus) cf. (72)(b), although, e.g., in Bolinger (1972) the relevance of intonation is duly stressed.

When examining the way how the distinction between presupposition and presumption (as defined by Joshi) is determined by the structure of the interrogative sentence, one easily finds that the difference between the placement of intonation centre on the *wh*-element and on some other element of the question is only one of the relevant factors: While this criterion is sufficient for such examples as (73) or (74) (where a negative answer is

acceptable only for the (a) variants, so that (c) is a presumption of (a) and a presupposition of (b)), in other examples, such as (75), (c) belongs to the presuppositions of both (a) and (b).

(73)(a) Who came LATE?
(b) WHO came late?
(c) Someone came late.
(74)(a) What did you buy for him for a Christmas PRESENT?
(b) WHAT did you buy him for a Christmas present?
(c) You bought him something for a Christmas present.
(75)(a) Why did you come so LATE?
(b) WHY did you come so late?
(c) I came late for some reason.

These considerations led us first to a preliminary hypothesis that this distinction is connected with that between inner participants (theta-roles, cases) and free modifications (adjuncts). It soon turned out, however, that the facts are not so simple. There are examples in which an interrogative sentence with a *wh*-element in the syntactic position of a free modification is connected with the presupposition (c) only in its (b) variant; this is the case in Joshi's example (66) above, as well as in (76), and probably also (77). On the other hand, there are examples of interrogative sentences which include a *wh*-element in the position of an inner participant, but are connected with a respective presupposition in both variants (cf. (78), where (c) is a presupposition of both (a) and (b)).

(76)(a) How many people DIED?
(b) HOW MANY people died?
(c) Some people died.
(77)(a) When did you visit ITALY?
(b) WHEN did you visit Italy?
(c) You visited Italy at some time.
(78)(a) To whom did Mary give the BOOK?
(b) To WHOM did Mary give the book?
(c) Mary gave the book to someone.

Also (79), quoted by Bierwisch in the discussion at the conference on question-answering at Visegrad, May 1980, behaves similarly as (78) above, i.e. the answer "Nobody" is inappropriate; it is connected with a presupposition failure.

(79) Who took my COFFEE?

The position of the intonation centre is connected (as we have already remarked) with the topic-focus articulation of the sentence; if the bearer of the intonation centre is the *wh*-element, all other elements of the interrogative sentence belong to the topic of the sentence. It is quite natural that, if the verb is included in the topic, the event (action) identified by such a verb is assumed to be "given" and the answer to the question by a negative pronoun renders a presupposition failure, as in (73)(b) above. However, even this is not a fully reliable criterion: compare (80), in which all elements except the attribute *French* belong to the topic, and yet a negative answer (b) is fully appropriate.

(80)(a) Where is there a FRENCH film on?
(b) I'm sorry there is no French film on this week.

Also other examples have been found where the situation is not quite clear: as for *how many*, an explanation offers itself that in interrogative sentences standing close to mathematical formulations (see, e.g., (81)) also the variant (b) may have the negative pronoun as an appropriate answer.

(81)(a) How many points with the mentioned properties lie inside the triangle as specified ABOVE?
(b) HOW MANY points with the mentioned properties lie inside the triangle as specified above?

Our discussion indicates that a further empirical investigation of some larger corpus is necessary, because also some contextual features seem to be at stake here, which have not yet been systematically studied.

Joshi made an analogy between his concept of a presumption (mentioned above) and the notion of allegation of a declarative sentence. I am convinced that his analogy is corroborated by the following argument:

If the interrogative sentence is understood as a request having the form of a declarative sentence, then e.g. (82) differs from (83) just in topic-focus articulation; the question word is the only element of the focus of (83), so that *somebody coming late* is included in the topic (it is not in the scope of the negation) and it belongs to the presuppositions of (83). In (82) *coming late* belongs to the focus of the question and is connected with an allegation: (84) may be followed by (85) as well as by (86).

(82) I request you to tell me who came LATE.

(83) I request you to tell me WHO came late. (=...WHO it was who came late).
(84) I don't request you to tell me who came LATE.
(85) I know all were there in time.
(86) I know that John did.

However, as we have remarked, *why*-questions (and perhaps others) seem never to allow for an answer with a negative pronoun, i.e. they are connected with presuppositions even if the "inducer" of the presupposition belongs to their focus: in this they behave similarly as sentences with factive verbs and (simple) proper nouns.

It should be emphasized that we do not claim that presuppositions and "inclusion in the topic" are the same phenomenon; the inclusion in the topic of the sentence is only one of the factors that lead to presuppositions, the other being the syntactic structure of the sentence (factive verbs with their complements), proper names, questioned modifications such as *why*, and perhaps others. Thus inside a topic, there may be elements with "multiple" or "strengthened" presuppositions, cf., e.g., (87) and (88).

(87) Why did John marry JOAN?
(88) Why did JOHN marry Joan? (= Why it was JOHN who married Joan?)

In (87) the presupposition that Joan is married is based on the fact that (87) is a *why*-question, while in (88) the placement of the intonation centre on John (as well as the cleft construction in the equivalent structure) "strengthens" the said presupposition, since in (88) the fact of Joan being married is stated in the topic of the question (as "given" and recoverable information).

In this connection, Hintikka's (1978) modification of his original proposal for a formal treatment of questions is worth mentioning. He distinguished within a question two ingredients, namely the optative (or imperative) operator and the desideratum; the presupposition of a question then equals to the desideratum of the question minus its initial epistemic operators. Thus (89) would entail that the speaker wants it to be made true that (90), which arguably implies (91). As Hintikka (1978:286, ex. 25 to 27) says, this would lead to a mistaken implication: "part of the force of the question would be to try to marry Mary off". Therefore he modifies the optative operator and changes the original formula into (92).

(89) Who is Mary married to?
(90) (Ex) K_1 Mary is married to x.
(91) (Ex) Mary is married to x.
(92) Assuming that (Ex) F(x) bring it about that (Ex) K_1 F(x).

The motivation of the change seems to be clear; the consequences of its acceptance are somewhat dubious. What happens if the assumption (evidently of the questioner) is not fulfilled (i.e. there does not exist any x such that F(x))? Tichý (1978) would say that such a question "does not arise", but it does arise, as is exemplified by (89).

2.4.5 Passing to the *yes/no* questions, we can take Kiefer's (1980) considerations as the point of departure. He uses again the notion of background assumptions (a proposition that is formed by substituting a Pro-element such as *somebody*, *sometime*, etc., for the focused element in the question) and for that purpose he distinguishes a focused part of the question (*tomorrow* in (93)). If there is such a focused part present in a question, then the speaker takes the background assumption for granted and asks, in fact, for a more specific modification.

(93) Is John leaving for Stockholm TOMORROW?
(94) WHEN is John leaving for Stockholm?

Thus (93) should be interpreted by the hearer similarly as (94); if the hearer answers by a simple No, then the answer is not complete from the point of view of the questioner.

On the other hand, if (in Kiefer's terms) there is no focused element in the question (as in (95)), then the speaker wants to know whether his assumption is right or wrong:

(95) IS John leaving for Stockholm tomorrow?

In this case, the answer *No* is a complete answer.

Two remarks should be added. First, it is true that with a question such as (93) the negative answer *No* may mean that the speaker admits that John is leaving for Stockholm, but that it is not tomorrow, while in (95) - with the intonation centre on the verb - this cannot be the case. In our approach to topic-focus articulation every sentence (including interrogative sentences) - has a focus. In (93), the focus is the time adverbial *tomorrow*; in (95) only the verb belongs to the focus. In case the verb belongs to the topic, the action

(event) identified by the verb is assumed as "given" and a negative answer to the question has in the scope of negation only the focused part of the sentence (e.g. "he leaves for Stockholm, (but) not tomorrow").

Also other examples show that yes/no questions are sensitive to topic-focus articulation in the same manner as declarative sentences are, and that in yes/no questions the type of presuppositions connected with the inclusion of an element into the topic of the sentence is also present. If the speaker asks (96), then in one of the readings of the question only *Stockholm* belongs to the focus, i.e. this reading is connected with the presupposition that John is leaving tomorrow for some place.

(96) Is John leaving for STOCKHOLM tomorrow?

The hearer can state that this presupposition is not fulfilled (as, e.g., in (97)).

(97) Oh, you are mistaken, John is not leaving tomorrow.

The "markedness" Kiefer ascribes to some of his examples is not surprising if we accept that there exists a systemic ordering of complementations of verbs observed in the focus part of the sentence; every sentence the complementations in which are not ordered in accordance with this systemic ordering has some feature of markedness in Kiefer's sense. Thus (98) - his (37)(b) - has the order direction - means (manner), which is not in accordance with the systemic order of these complementations (*I'm going by train to STOCKHOLM* rather than *I'm going to Stockholm by TRAIN* is a most natural answer to *What are you doing TOMORROW?*). In such a case the phrase *by TRAIN* is (as Kiefer says) almost exclusively determined as the focus of the question (*to Stockholm* belongs to the topic if it is moved to the left of *by TRAIN*).

(98) Are you going to Stockholm by TRAIN?

The same holds true when the intonation centre is placed on an element in some other position than the final one: this has the consequence that all modifications (participants and/or adjuncts) following the bearer of the intonation centre are in the topic. Our explanation of the "marked character" of (99) - Kiefer's example (38) - consists in the fact that the marked intonation of (99) is combined with a marked word order, differing from the systemic ordering.

(99) Are you going to STOCKHOLM by train?

The non-marked counterpart of (99) is (100), with the order means - direction.

(100) Are you going by train to STOCKHOLM?

Here, it is not quite clear where the boundary between topic and focus lies: not only the verb, but also the phrase *by train* can belong to the topic (if they are contextually bound), as well as to the focus (if it is non-bound).

This example illustrates the interplay of word order, intonation, communicative dynamism and contextual boundness in yes/no questions and suggests a possibility how to account for this interplay by means of a framework which has been found to give valuable results for declarative sentences.

2.5 Principles for a Specification of Underlying Representations

The valency-based approach to syntax, which allows for a description of the topic-focus articulation and of the scope of negation integrated in the underlying structure of the sentence, makes it also possible to formulate the description of sentence structure in the shape of a very restricted set of general principles. This might be helpful in the sense of delimitation of innate properties restricting the child's choice in the acquisition of her/his mother tongue, as postulated by Chomsky.

The principles enumerated below can also be understood as fundamental ingredients of a model of what V. Mathesius (1936) called denomination and bringing into relation, and what was more amply characterized by G. Guillaume (1964, 1984) as "the act of language," i.e. the procedure of formulating a sentence, consisting of a set of mental operations carried out by the speaker.

The speaker's repertoire of means of expression is constituted by the lexicon and the grammar of the language used. While languages grossly differ in what concerns the relationships between underlying and surface (or, more precisely, morphemic and phonemic) structures, they share the basic organization of their underlying structures (at least this seems to be valid for classical and modern languages of Europe and of a large part of Asia).

In the underlying layer of language structure, i.e. in the layer of tectogrammatical representations (TR's), the speaker has at her/his disposal (a) the lexical entries, including their valency grids, and (b) a basically simple procedure of the choice of a word token within the formulation of (the underlying shape of) an utterance (understood here as an occurrence of a sentence).

In point (1) below we specify the shape of a lexical entry (general conditions it has to meet), and points (2)-(6) characterize the specification of the class of TR's in the form of a generative procedure restricted by certain further conditions. It seems to be possible without any problems of principle to formulate a corresponding declarative specification.

Principles of the generation procedure for underlying dependency trees:

(1) The *lexical entry* contains:

(a) a *lexical* unit (i.e. a representation of its meaning) with its underlying word class,

(b) a specification of its possible *grammateme* values (definite, plural, future, etc.),[26]

(c) its *frame* or grid (i.e. the list of its possible complementations, such as Actor, Addressee, Objective, Locative, Instrument, etc., ordered in accordance with the systemic ordering), in which *inner* participants (occurring at most once with a head node) and *obligatory* adverbial ('free') complementations are marked,[27] and

(d) the other *subcategorization* conditions.[28]

(2) To *generate a node* (root or daughter) means also to choose its lexical value and the values of its grammatemes (taking into account, by means of unification, the subcategorization conditions of the mother node; if there is no mother node, i.e. a root is being generated, then it is a finite verb);

[26] Grammatemes (delimiting feature, number, tense, etc.) are listed for every word class as a whole, and so are restrictions on the combinations on their values; only exceptions have to be listed in the lexicon, the regular possibilities being identified in the process of generation, whenever a lexical unit is being chosen.

[27] Free optional complementations are found in the repertoire common for the word class as a whole, whenever a lexical unit is being chosen.

[28] Notice that also other properties concerning a certain complementation in its relationship to a certain governor can be marked here, if necessary, e.g., a specific degree of closeness (of an 'inner object' to its verb), or a possibility to occupy a specific position in the surface word order (e.g., before the governing verb), to be deleted by shallow rules, and so on.

the just generated node is considered as node n in the next step of the procedure. If a root is generated, it is denoted either as CB (contextually bound, belonging to the topic) or as NB (non-bound, belonging to the focus).

(3) If there is a complementation listed in the frame of the node *n*, then it is possible to generate

(a) either a *left daughter* of *n*, denoted as CB and as any complementation from the frame of *n*,

(b) or to generate a *right daughter* of *n*, denoted as NB and as a complementation chosen from the left end of the frame of *n*.[29]

(4) If no complementation is present in the frame of *n* (see fn.16), then we turn *back to the mother* of *n*, which now is to be considered as node *n*; if no mother is present, the procedure is *finished*.

(5) Sister nodes are generated in the left-to-right *order* (i.e. if node *n* has a sister, then the latter stands to the left of *n*).

(6) Only trees containing a *focus* are understood as underlying representations of sentences (i.e. only those whose branch going from the root to the rightmost daughter of ... of the root includes a NB node).

The difference between (3)(a) and (b) makes it possible to account for the fact that in focus CD coincides with systemic ordering, see Section 2.2.2 above. It may be seen that this approach allows even for such a strong assertion to be handled in a very economical way.

Complications not handled by these principles include coordination and apposition, agreement of relative words (and Vocative) in number, further control and focalizers; a procedure handling most of them and generating the underlying representations in the direction from the left to the right (thus modelling the processual character of the speaker's act) was presented by Petkevič (1987).

[29] If the chosen complementation is an inner participant, it is deleted in the frame of *n*; choosing a complementation "from the left end" means that non-obligatory complementations can be skipped and deleted; if the last one is deleted, no right daughter is generated in this step, and point (4) is then carried out.

3 DISCOURSE PATTERNS: ANAPHORIC RELATIONS

In this chapter we concentrate above all on issues of coreferential and anaphoric patterns in discourse. We start with a brief discussion of the difference between how the notion of focus is understood in linguistics (i.e. in connection with the topic-focus articulation) and how a notion indicated by the same term is handled in artificial intelligence, abbreviated as AI (where it is derived from the psychological concept of focus of attention), see Section 3.1. We turn then to a characterization of the degrees of salience of the items in the stock of knowledge or information shared by the speaker and the hearer(s), which represent a basic component of a finite mechanism enabling the users of language to specify the otherwise indistinct reference of pronouns and noun groups (Section 3.2). Finally we proceed to the problem of the topic of a discourse as a whole or of parts of a discourse (Section 3.3).

3.1 Focus in Linguistics and in Artificial Intelligence

During the recent years we have witnessed a curious situation: not only that a single term has been used for two *different* notions (which is a common situation even within a single field of science), but it has been used exactly for two *opposite* notions. This is the case of the term *focus*: introduced into linguistics by Halliday (1967) and by Chomsky (1968), and employed since then by linguists of most different breedings (cf. its systematic treatment in the framework of functional generative description, or FGD, e.g. in Sgall, Hajičová and Benešová, 1973, and in Part 2 above), it was soon frequently used in the writings closely connected with the research in the domain of AI (cf., e.g., Grosz, 1977; Sidner, 1979); the latter use is said to stem from works on (cognitive) psychology.

To be able to refer to the readings of a single term, in the sequel the transparently indexed label $focus_L$ is used for the former (linguistic) understanding and $focus_{AI}$ for the AI interpretation. For the purpose of our discussion that follows, $focus_L$ can be informally specified as that part of the (meaning of the) sentence that conveys some (irrecoverable) information predicating something about 'the given', recoverable, contextually bound part

(i.e. of the *topic* of the sentence, see Part 2 above). Taking (1) as a part of discourse consisting of (a) and (b) in this order, then $focus_L$ of (b) is *had been crying nearly all the day*. In terms of the AI-oriented research, $focus_{AI}$ of (b) refers to the baby, since the baby is one of the items 'just introduced' (namely, by (a)) and the utterer of (b) focusses his/her attention on it. In terms of linguistic analysis, however, the expression referring to the baby in (b), namely the pronoun *it*, belongs to the topic rather than to the $focus_L$ of (b).[30]

(1)(a) The mother picked up the baby.
(b) It had been crying nearly all the day.

The connecting ties between $focus_L$ and $focus_{AI}$ immediately emerge, if one takes into account a dynamic character of the development of the discourse: at the initial point of a discourse, the interlocutors share a certain "stock of knowledge", part of which is activated by the situational context. During the discourse, the stock of knowledge the speaker assumes to share with the hearer(s) changes according to what is in the centre of attention at the given time-point, what is most salient or activated (foregrounded) in the memories, what has been just said. The speaker chooses, in a smooth discourse, only those items to be used in the topic of the sentence which he supposes to be among the most salient in the stock of knowledge of the hearer; this enables the hearer to identify relatively easily the objects referred to by the parts of the topic of the sentence.

Thus, after 'the baby' has been foregrounded by uttering (1)(a) (*the baby* constitutes (a part of) the $focus_L$ of (1)(a)), the image of the object in the interlocutors' memory identified by the expression *the baby* becomes highly activated in the stock of knowledge shared by the speaker and by the hearer; in the sentence that follows, the expression identifying this object belongs to the $focus_{AI}$ (of attention), while referred to by the topic of the sentence, even by means of a pronominal form (viz. *it* in (1)(b)).

However, an item is activated also after its mentioning in the topic part of the sentence, see (1)(b') as another possible continuation of (1)(a):

(1)(b') She had been ironing all the afternoon.

[30] In our examples we work with a single reading of the quoted sentences. It should be emphasized, however, that most sentences allow for an ambiguity in the assignment of topic and focus which corresponds to Chomsky's notion of the range of permissible focus (see Section 2.2. above).

When uttering (1)(b'), the speaker assumes 'the mother' to belong to the items activated above a threshold making it possible to refer to it by a pronoun in the topic part of the next utterance; this activation has been achieved by mentioning the mother in the immediately preceding sentence.

While a non-activated item can be referred to *only* in the $focus_L$ part of the sentence, an activated item can be referred to in the topic *as well as* in the $focus_L$ part of the sentence (marginal cases concerning embedded items are left aside in this Section). In the latter case, such an item is referred to by a definite NP or an anaphoric pronoun and carries as a rule the intonation center of the sentence; see the sequence of (2)(a) through (c):

(2)(a) John and Mary met at the railway station.
(b) She greeted him,
(c) and only then he greeted HER.

In (2)(c), *her* used in the $focus_L$ of the sentence refers to Mary, whose image in the stock of knowledge assumed by the speaker to be shared by the hearer is activated to such an extent that the speaker can use a pronominal form; also John's image in this stock of knowledge is activated so as to make a pronominal reference possible; in our (linguistic) terms, the sentence (2)(c) is structured in such a way as to say something *about* John (*John* is in the topic part), viz. to assert that it was HER who was greeted by him.

The following three short discourses (3)(a) through (c), sometimes called by American speakers 'focussing jokes' (the jokes were selected from J. Rosenbloom, *Biggest Riddle Book in the World*, New York, 1976), can further illustrate issues of $focus_L$:

(3)(a) Why do firemen wear red suspenders?
To keep their pants up.
(b) Why do we buy clothes?
Because we can't get them free.
(c) Why do we dress baby girls in pinks and babyboys in blue?
Because they can't dress themselves.

What is the source of the humorous effect of these pairs of questions and answers? An attempt to provide an explanation can be found as long back as with S. Freud, who analyzes the joke quoted here as (4) (cf. S. Freud, 1905).

(4) The first Jew asks: "Have you taken a bath?" The second replies asking the other in return: "Why? Is there one missing?"

Freud looked for the explanation in the shift of contrastive stress: if this stress is on 'bath', then the verb and its object are interpreted in the meaning of the collocation 'to take a bath', i.e. to wash in a bath; if the stress is on 'taken', then the verb 'to take' is interpreted as 'to steal'.

Looking back at our examples in (3) from the perspectives of stress assignment, we see that the humorous effect stems from a shift in the intonation center (IC): the addressees of the jokes expect the IC's to be placed in an unmarked position, i.e. at the end of the first sentence (question) of the piece of discourse. However, the second sentence answers a different question, namely a question with the IC shifted to some other position in the sentence. In all the quoted examples, this shift can result in the IC placed on the *wh*-word 'why'; for (b) and (c), there are also the possibilities to place the IC on 'buy' and 'we', respectively. Thus, e.g., if the first sentence in (3)(a) is pronounced with the IC on 'red' or 'suspenders', the addressee of the joke expects the answer to explain why the colour of the suspenders is exactly red and he is surprised to get an explanation as if the IC were on 'why', what is the reason of having suspenders at all. A similar explanation holds for (3)(b): with an unmarked IC on 'clothes', the addressee expects to learn, e.g., that people buy them to protect themselves from cold, while the answer actually given answers a question why we buy the clothes rather than obtain them in another way. In (c), the expected situation is as if the IC were placed on 'in pinks' and 'in blue'; however, the second sentence indicates that the answerer understood the question as questioning the fact why it is us who dresses the children.

Interesting examples with different positions of IC were made by D. Wilson (1986). Her examples are quoted here as (5) and (6), where the IC is denoted by capitals.

(5) I'm sorry I'm late. My CAR broke down.
(6) I'm sorry I'm late. My car was BOOBY-trapped.

The two sentences following the apology are formulated with different relations between the recoverable and the irrecoverable information: In (5), the speaker assumes that the hearer anticipates some break-down to be the reason of the speaker's late arrival and he specifies that it was the car what broke down. In (6), the expectations of the speaker are different: here the recoverable information concerns the fact that the speaker came by a car, and the specification of the reason of coming late concerns the fact what happened with the car.

The common denominator of the distinctions in meaning illustrated up to now is a different topic-focus$_L$ articulation of the utterances which are component parts of the pieces of discourses analyzed. In our examples, the distinction in the topic-focus$_L$ articulation was expressed in the surface shape of the sentences by means of different positions of IC; in cases of so-called free word order, the same (semantic) distinction can be expressed by shifts in the word order; in some languages these distinctions can be expressed by specific morphological forms or syntactic structures. Let us recall that in FGD topic-focus articulation is considered to be one of the dimensions of the representation of the (literal) meaning of the sentence.

An interesting question that arises in this connection is to what extent the topic-focus$_L$ articulation of the individual sentences is relevant for the changes of the degrees of activation (salience), which help the hearer to identify the reference of referring expressions.

(a) It is rather obvious that the items referred to by the parts of the focus$_L$ of the immediately preceding sentence are the most activated ones at every time-point of the discourse.

(b) If an item is referred to in the topic part of the sentence, then at least two issues are to be taken into consideration:

(i) A pronominal reference seems to "strengthen" the activation of the item referred to to a lesser degree than a reference with a full (definite) NP.

(ii) The activation of the items referred to in the topic part of the sentence seems to 'fade away' less quickly than that of the items referred to in the focus$_L$ part of the sentence.

(c) If the degree of activation of an item *x* is being changed (lowered, or raised), then also the degree of activation of the items associated with the object referred to by *x* is being changed in the respective direction. It should be taken into consideration, however, that frequently a mentioning of a particular object brings into the foreground only a fraction of a set of objects that has been activated earlier. Also other scales or hierarchies should be considered: thus, there is a hierarchy of more or less immediate associative relationships, or that of prominence with regard to the individual sentences and their positions in the text (e.g. sentences metatextually opening a narration or one of its portions, headings, etc., are more prominent than other elements of the text, in that the objects which the former introduce retain their activation to a higher degree than objects introduced in the latter parts), etc.

(d) If an item of the stock of shared knowledge is neither referred to in the given utterance, nor included among the associated objects, then its activation lowers down; as mentioned in (b)(i') above, the drop in activation

is quicker if the item was referred to in the $focus_L$ of the preceding utterance and slower if it was referred to in the topic part of the previous utterance.

(e) There are some specific expressions in particular languages that 'give prominence' to the items they precede in that they raise their activation more than otherwise would be the case. This holds e.g. about the English phrases *as for* ... or *concerning* ...: they function as 'thematizers' (a term suggested by G.D. Rinnan, pers. comm.) and introduce a topic that was not expected, i.e. the sentence recalls an object that is being mentioned only after an occurrence of several intervening sentences.[31]

An interesting convergence between the linguistic and the AI-oriented treatment of the dynamic aspects of discourse can be illustrated by the study of McKeown (1985). At least three points of agreement are worth mentioning:

In her discussion of a more differentiated approach to $focus_{AI}$, McKeown works with three graded notions:

(a) the immediate focus of a sentence (current focus, CF);

(b) the (partially ordered) potential focus list (PFL), including the elements of the sentence that are potential candidates for a change of focus;

(c) a focus stack (a stack of past immediate foci).

If we look at these notions from the point of view of the approach to the hierarchy of activation of the stock of shared knowledge, then:

(a) at a certain time-point t_n at which the sentence S_n is being uttered, the CF of S_n is that element from the activated part of the stock of shared knowledge that has been chosen by the utterer of S_n as its topic proper;

(b) the PFL after the utterance of S_n includes those items of the stock of shared knowledge that belong to the most activated layer of the stock; we doubt that it might be sufficient to work only with the elements of S_n as the possible candidates for a change of $focus_{AI}$ in S_{n+1}, since the latter also can be chosen from elements other than those included in S_n, if they are activated to a sufficient degree for such a choice, cf. Garrod and Sanford's (1982) test examples quoted here as (7)(a) through (c):

(7)(a) The engineer repaired the TV set.
(b) It has been out of order for two weeks.
(c) The engineer/He took only five minutes to repair it.

(c) The focus stack at the time-point t+1 (i.e. when uttering S_{n+1}) contains the $foci_{AI}$ of S_n, S_{n-1}, ..., S_1, i.e. the topics proper of S_n, S_{n-1}, ..., S_1.

[31] For a further discussion and a tentative formulation of rules corresponding to the points (a) through (e), see Hajičová and Vrbová (1982) and here in Section 3.2.

When specifying the legal $focus_{AI}$ moves, McKeown (1985:66f) imposes the following order of preferences:

(A) 1. change $focus_{AI}$ to member of previous PFL if possible;
2. maintain focus if possible;[32]
3. return to topic (used in its non-terminological sense, EH) of the previous discussion; more precisely, choose the CF from the focus stack.

Confronting again this hierarchy of the choices of the speaker with what we said above about the degrees of activation, one arrives at an extensive coincidence, too:

(L) 1. the highest degree of activation is found with those items that are referred to explicitly in the previous utterance; the absolutely highest degree is assigned to those items that are identified by the $focus_L$ of the immediately preceding utterance;

2. the next-to-the highest degree of activation is assigned to those items that are identified by the elements of the topic of the immediately preceding utterance (i.e. included in its $focus_{AI}$);

3. the next lower degree of activation is assigned to those items that have been mentioned in some preceding utterance or are in some associative links with those mentioned in them.[33]

Even a perfunctory look at the sets (A) and (L) shows that the strategy offering the speaker a choice on the basis of the degrees of activation (with the items which have the highest degrees being most at hand) does not contradict in any point the one proposed by McKeown; as a matter of fact, the activation hierarchy offers a more variable choice, not damaging the coherence of discourse.

The procedure of generation as formulated by McKeown starts from the so-called default $focus_{AI}$;[34] each predicate is assigned a default focus, which is such a phrase that can be expressed as the surface subject of an active sentence including that predicate; the default $focus_{AI}$ can be 'overridden' only

[32] McKeown's formulation of two separate steps quoted here as (A)1. and 2. seems to suggest that CF of the last utterance is not a member of PFL of the last utterance.

[33] (L)3 differs from (A)3 in that the latter does not take into account the associated objects, which is explicitly admitted in McKeown (1985:67).

[34] If we understand well McKeown's treatment, 'predicate' is used here in the sense of 'rhetorical predicate' (following, e.g., Grimes), so that 'arguments' stand for very abstract cognitive roles such as feature and entity with an attributive predicate. In our approach we work with participants of verbs (deep cases, theta-roles) such as Actor/Bearer, Addressee, Objective, Origin, Effect, and adverbials (see Chapter 1).

by such a choice of $focus_{AI}$ that stands higher than the default $focus_{AI}$ on the hierarchy summarized here as (A)1 through 3 (in this order). In our terms, a verb is passivized if the NP in the subject position of the passive identifies an item that is activated in the stock of shared knowledge to a (considerably) higher degree than the item identified by that NP which would be in the subject position of the active sentence. Such a strategy is in accordance with Mathesius' (1915, 1929) specification of the main function of subject in English: English uses passivization for the same purpose as the languages with the so-called free word order use the word order variations, namely to start the sentence with what is the sentence about, if the latter is not the underlying subject, or Actor/Bearer.

3.2 Salience in the Stock of Shared Knowledge

Let us come back to the linguistic issues concerning communication. It is one of the fundamental aspects of the process of communication that one of the participants in this process, the speaker, attempts to cause the other participant(s), the hearer(s), on the basis of the rules of the given language, to modify some elements of the information stored in their memory. Since the system of the knowledge stored in human memory is very large and structured in a very complicated way, it is useful for the speaker to specify first those elements that are easily accessible in the hearer's memory (salient, activated), and are to be modified (or introduced into new relations with some other elements), i.e. the topic; only then does the speaker specify (by the focus) which modification or which new relations are to be achieved.

The speakers cannot simply choose any of the elements of information as parts of the topic, but only those that they believe to be activated at the given point of the discourse, that are in the foreground of attention (or in a very close associative connection with the highly activated elements). The hearers then do not need to make much effort to identify them.

The stock of shared knowledge (comprising not only knowledge in the literal sense, but a wide range of psychological phenomena including beliefs and other attitudes shared by the speaker and the hearer) is one of the critical notions in the theory of topic and focus with the framework of Functional Generative Description. It is assumed that the stock of shared knowledge has a dynamic character: not only the repertoire of items it includes is changed but also their activation (salience), in the sense of being immediately accessible in

the hearer's memory.[35] As was pointed out in Hajičová and Vrbová (1981), this hierarchy of salience is argued to be a basic component of the mechanism serving for the identification of reference, since the following regularities hold:

The mentioning of an object or of another item that is in some kind of relationship to it gives rise to a higher degree of activation of this object. The relationship between anaphorically connected items may be of different kinds: it may be an identity relation, as, e.g., *pupils* in the sentences (5a) and (6) in the text presented below (referred to by an identical noun), or (5b) (with a pronominal reference), or even (1) (referred to by the noun *children*, which - in the given context - functions as a more or less synonymous expression for *pupils*), or the link between concepts can be given by some associative relation such as inclusion of classes (see (3) and (4a), with *father* as a member of the class of *parents*), part of a whole (see (1) and (13), with the *ground* as a part of the *school garden*), etc., or some kind of relation given by the broader scene of the action (the notion of school introduced in (1) brings about also the notion of teachers, who are referred to in (2b) by a definite noun).[36]

The expressions referring to the activated elements may function as contextually bound, and thus constitute the topic of the sentence, while the non-activated ones are always contextually non-bound, and thus included in the focus of the sentence. An activated element may also be referred to by a part of the focus of the sentence: if focus proper is expressed by a pronoun, it has

[35] We have seen in 3.1 that in AI similar reasoning has been present. Grosz (1977) in her very interesting analysis of the structure of a dialogue is rather close to the notion of hierarchy of salience, assuming (p.66) that at any point (in a dialogue), only one "focus space" (by a focus space she means a subunit of the knowledge base that "contains those items that are in the focus of attention of the dialogue participants during a particular part of the dialogue", p.5) is active, but several may be considered open (i.e. they reflect active spaces that contain some unfinished "topic" in the sense of "topic of discourse" - and hence they may become active again).

[36] The relations between the elements shared by (at least) two subsequent utterances in a text are discussed in great detail by Enkvist (1974); he postulates the following (rather disparate) kinds of theme identification: repetition, reference, synonymy, antonymy, comparison, contracting, hyponymy, membership in the same semantic field, sustained metaphor. Daneš (1979) distinguishes between referential identity (which may be rendered by repetition, pronominalization, ellipsis, substitution by synonyms, etc.) and referential difference (with links given by semantic similarity, e.g. inclusion or contiguity, e.g. collocation, part of a whole). Cf. also different kinds of "bridging operations" in Clark and Havilland (1977) and their discussion in Kieras 1977). From a more general perspective, these issues are discussed within a broader context of text cohesion; cf. Halliday and Hasan (1974), the studies of textual relationships by Agricola (1979) and Viehweger (1978); the notion of contextual space (Reichman, 1978; Grimes, 1980) or of focus space (Grosz, 1977).

the form of a stressed pronoun. It is more precise to speak about a contextually non-bound lexical item than about "new" information (taking into account that 'context' includes relevant factors of the situation of the discourse).

In the present Section, while illustrating some of the issues pointing to the relevance of this hierarchy on a fragment of an English text, we want to present a few points that may throw some light on the changes of the activation of the elements of the stock of shared knowledge rather than to give a systematic linguistic analysis of the given text. We restrict ourselves to objects identified by NP's or pronouns and we leave aside actions and their circumstantial qualifications.

The sample of text (for the ease of further reference the clauses are assigned serial numbers; the capital letters denote the intonation centre of each clause):

(1) The school garden was full of CHILDREN.
(2a) They talked NOISILY,
(2b) but the teachers didn't REPROVE them,
(2c) because they were so EXCITED.
(3) Outside PARENTS were waiting.
(4a) One of them, a father, stood in front of a MICROPHONE,
(4b) as if he were prepared to TALK.
(5a) The pupils got CALM
(5b) and their teachers lined them UP.
(6) Both pupils and teachers were in a festive MOOD.
(7) The teachers were SERIOUS.
(8) In fact, all ADULTS in the garden were serious.
(9) They were dressed in evening DRESS.
(10a) As for the pupils, they had school UNIFORMS,
(10b) neatly washed and PRESSED.
(11) The smallest even had snow-white COLLARS.
(12a) One of the parents approached the biggest BOY
(12b) and ASKED him:
(13) "Is it allowed to sit down on the GROUND?"

In the opening sentence of the text two objects are introduced: the school garden and children. Since the latter object is mentioned in the focus of the sentence, it becomes more salient than other objects mentioned previously or activated by their presence in the broader context of the situation. Fig.1 illustrates in a very preliminary and schematic way the state of the activated

part of the stock of shared knowledge after the utterance of (1); the hierarchy of activation is represented by the vertical dimension of the diagram. The children are thus most "at hand" for the speaker to be spoken about in the immediately following utterance. This is the case in (2a): the children, as a highly salient object in the stock of knowledge shared by the speaker and the hearer, are referred to in the topic position by a pronoun, which keeps their activation at the same degree, while the activation of the school garden, not having been mentioned in this utterance, fades away. In (2b) a new object enters the scene - the teachers; however, their appearance is not completely new and surprising, because the hearer has already been introduced into the scene of school, which has teachers associated with it. This is why the teachers can be referred to by a definite NP and why the speaker, without the danger that the hearer will be misled by his choice of the topic, can refer to the teachers by a contextually bound element. An element the linguistic counterpart of which is present in the topic part of the sentence and is rendered by a definite NP retains its character as one of the more activated items of the stock of shared knowledge. The children do not leave the scene yet; they are reminded - through a pronominal reference in the topic - and their activation in the stock does not fade away, they also remain in the most active part of the stock.

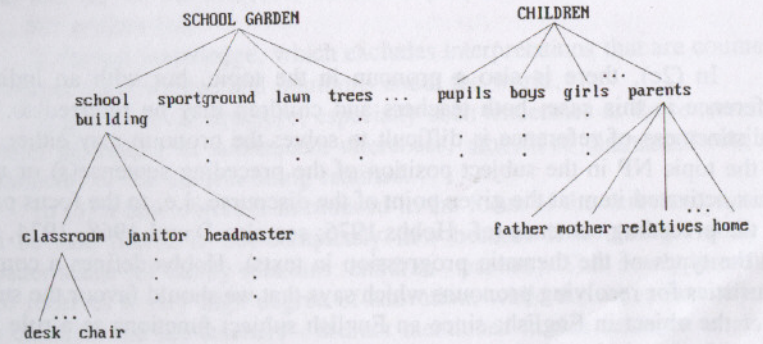

Fig.1

One comment is in order here: the pronoun *them* stands in (2b) in final position, but after the intonation centre; we assume that an NP (as well as an adverbial) following the bearer of the intonation centre belongs to the topic

part of the sentence. The resulting hierarchy of the activated elements of the stock of shared knowledge after the utterance of (2b) is illustrated in Fig.2.

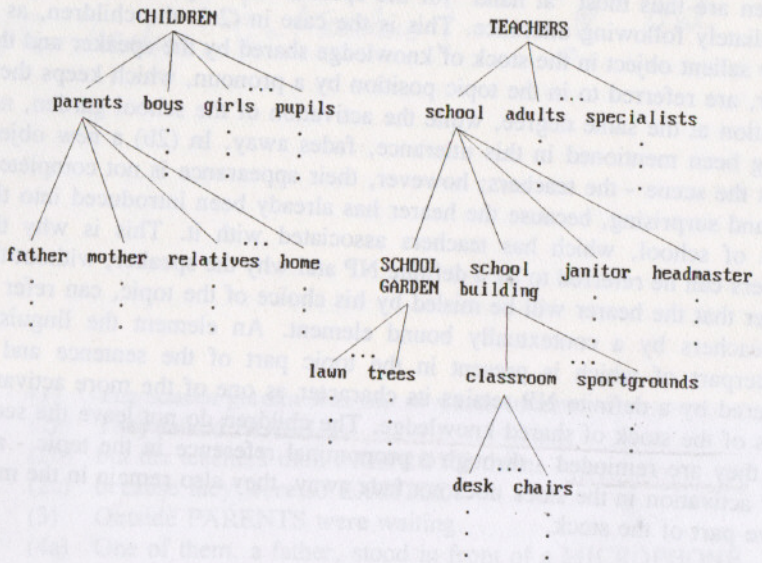

Fig.2

In (2c), there is also a pronoun in the topic, but with an indistinct reference in this case: both teachers and children may be referred to. This indistinctness of reference is difficult to solve: the pronoun may either refer to the topic NP in the subject position of the preceding sentence(s) or to the most activated item at the given point of the discourse, i.e. to the focus proper of the preceding sentence (cf. Hobbs 1976; see also Daneš 1968, 1974, 1976 on the types of the thematic progression in texts). Hobbs defines a common heuristics for resolving pronouns which says that we should favour the subject over the object in English; since an English subject functions as a rule as (a part of) the topic of the sentence, this heuristics says that the topic is preferably preserved in successive sentences. Another possible strategy includes inferencing and factual knowledge.

(14) The children got some SWEETS; they ate them immediately.

In (14) it is clear which occurrence of the pronoun refers to which object.[37] However, in the case of (2c), neither of the two strategies for the solution of the indistinctness of the pronominal reference helps us: the teachers as well as the children can be excited, so that both the subject and the object NP of the preceding sentences can be chosen as the referent of the pronoun. The degree of activation does not help us either, since both children and teachers are activated to the same extent at the point of the utterance of (2c). However, if the lexical setting of (2c) were changed, as in (2c') and (2c''), the indistinctness would be easy to solve, and only one of the two possible candidates of reference would be chosen, namely the teachers in (2c') and the children in (2c''):

(2c') ... because they were always kind to their pupils;
(2c'') ... because they were too small to understand the seriousness of the moment.

We may state now that, when looking for the possible referents of a pronoun, one should take into account the following aspects:

1. the salience of the elements at the given point of discourse, with (a) the most salient elements having precedence over the less activated ones, and (b) the element identified by an NP in the subject position having precedence over elements referred to by NP's in other syntactic positions in the sentence; if (a) and (b) do not coincide, then such pronouns as *he* prefer (b), while, e.g., *this* prefers (a),

2. factual knowledge, which excludes interpretations that are counter to the hearer's knowledge and intuitions about the world,

3. grammatical structure, especially such tendencies as those towards a parallel patterning of subsequent utterances, embedded elements being less prominent, or the subject being retained.

In (3) a new object is introduced in the focus of the sentence; again, it can be said that it is not completely new because it is also given by the broader scene (of family relations: children - parents). This newly introduced item receives a very high degree of activation, while the other two objects - the children and the teachers - are not mentioned in this sentence at all and thus their activation fades away (see Fig.3).

[37] Cf. Hobbs's (1979) use of the inferences based on the store of commonly possessed world knowledge to resolve reference ambiguities.

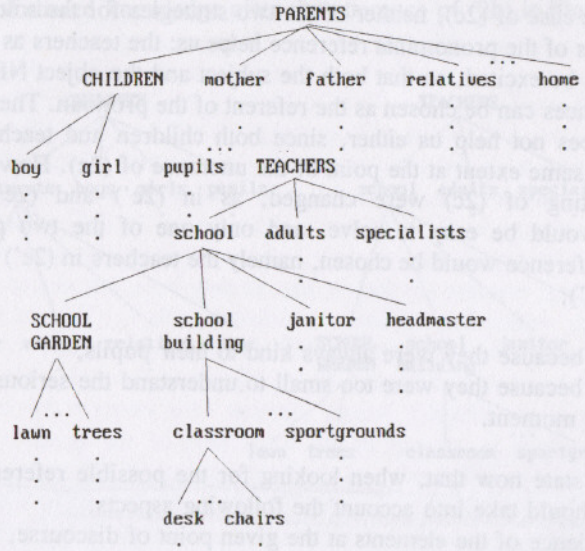

Fig.3

In (4a) the speaker chooses one element of the most activated set, namely that of the parents, and he adds some information about him; through the mentioning of this element in the topic of the sentence the activation of the whole set is preserved at the same level, while the activation of the other objects again is suppressed. A similar process occurs after uttering (4b): the most activated item is mentioned in the topic, its activation is preserved, while the activation of the rest of the stock is lowered. In (5a) and (5b) the children (mentioned as the pupils) and the teachers, respectively, are reactivated in the stock; though their activation was gradually fading away during the previous discourse, it was still higher than an assumed threshold, which made them available as possible topics of one of the next utterances. In (5b) not only the teachers but also the children are mentioned in the topic (the former by a definite NP, the latter by a pronoun), so that both the objects remain highly salient.

In a similar way, we can follow the process of activation as is reflected by the rest of the sample of text; this process is sketched schematically in Fig.4, where the lines follow the activation of the three objects (namely the *children*, the *teachers*, and the *parents*) in the course of the discourse.

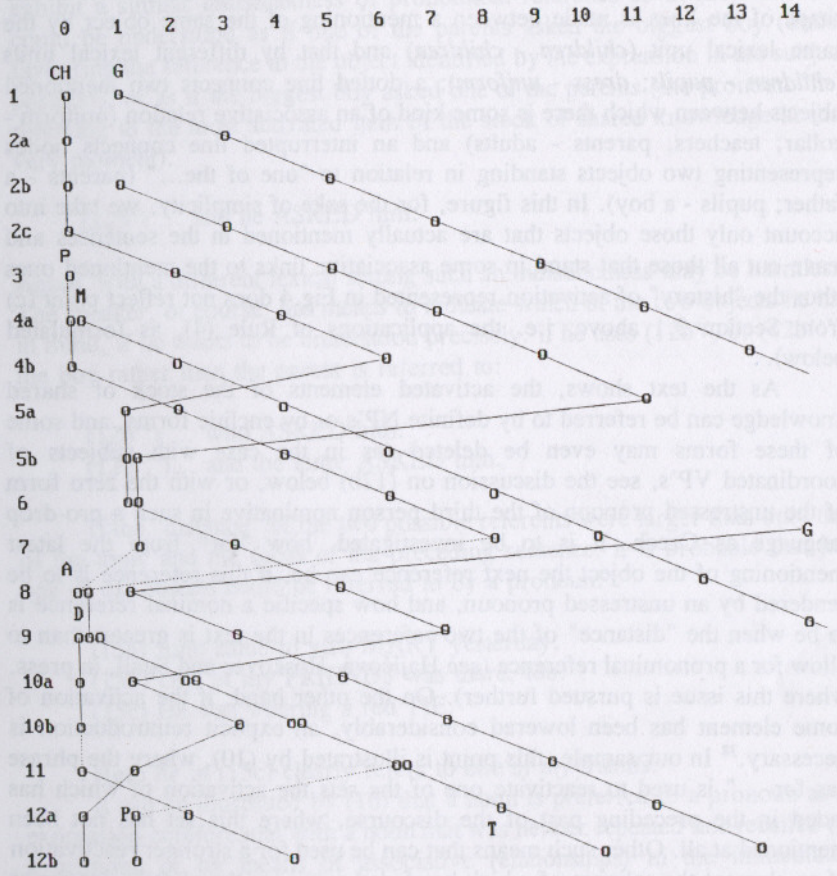

Fig.4

A schematic representation of the process of activation as reflected in the sample text.
Abbreviations: CH - children, F - father, P - parents, T - teachers, A - adults, M - microphone, G - garden, D - dress.

The lines in Fig.4 follow the changes of the activation of the objects mentioned in the text (decreasing from left to right); no distinction in the shape of the lines is made between a mentioning of the same object by the same lexical unit (*children - children*) and that by different lexical units (*children - pupils*; *dress - uniform*); a dotted line connects two mentioned objects between which there is some kind of an associative relation (uniform - collar; teachers, parents - adults) and an interrupted line connects nodes representing two objects standing in relation to "one of the..." (parents - a father; pupils - a boy). In this figure, for the sake of simplicity, we take into account only those objects that are actually mentioned in the sentences and leave out all those that stand in some associative links to the mentioned ones (thus the "history" of activation represented in Fig.4 does not reflect point (c) from Section 3.1 above; i.e. the applications of Rule (4), as formulated below).

As the text shows, the activated elements of the stock of shared knowledge can be referred to by definite NP's or by enclitic forms, and some of these forms may even be deleted (as in the case with subjects of coordinated VP's, see the discussion on (12b) below, or with the zero form of the unstressed pronoun of the third person nominative in such a pro-drop language as Czech. It is to be investigated, how "far" from the latest mentioning of the object the next reference can be, if this reference is to be rendered by an unstressed pronoun, and how specific a nominal reference is to be when the "distance" of the two references in the text is greater than to allow for a pronominal reference (see Hajičová, Hoskovec and Sgall, in press, where this issue is pursued further). On the other hand, if the activation of some element has been lowered considerably, an explicit reintroduction is necessary.[38] In our sample, this point is illustrated by (10), where the phrase "as for ..." is used to reactivate one of the sets the activation of which has faded in the preceding part of the discourse, where this set has not been mentioned at all. Other such means that can be used for a stronger reactivation of an element the salience of which has faded away are the phrases "as far as ... is concerned", "concerning ...".

In the sentence (12b) the deletion of the subject with the coordinated VP unambiguously points to the subject of the preceding sentence as being referred to (so that (12b) is interpreted by the hearer as meaning that one of the parents asked the biggest boy). However, if the speaker used a weak

[38] Cf. Reichman's (1977) examples of "interruption" relation between context spaces, rendered by means of such expressions as *incidentally*, *by the way*, etc., and of "return" relation, for which the expression (*but*) *anyway* is typical.

(unstressed) pronoun instead of the deletion (as in (12b')), the sentence would exhibit a similar indistinctness of pronominal reference as in (2c): either it could be understood as if one of the parents asked the biggest boy (under favouring the reference to the object identified by the expression in the subject position), or as if the biggest boy asked one of the parents (the pronoun "he" referring to the most activated item of the stock of shared knowledge at that very moment).

(12b') ... and he ASKED him:

Again, with a different lexical setting such an indistinctness may be harmless. The speaker, of course, has means to indicate which of the two objects he has in mind, if he wants to be understood precisely: if he uses (12b'') or (12b'''), the boy rather than the parent is referred to:

(12b'') ... who ASKED him.
(12b''')... and the latter ASKED him.

If the "distance" of the two possible referents were larger than only that of the topic and the focus of the preceding sentence, it is probable that just one of the objects could be referred to by a pronoun:

(15a) John came to visit MARY yesterday.
(15b) One of my FRIENDS was there, too.
(15c) He was wearing a red TIE.

Here *he* in (15c) clearly refers to *one of my friends*.

It can be illustrated by (16) that a noun is preferred to a pronoun as an expression coreferential with a noun that was neither repeated nor recalled (by a pronoun or by means of associative relationships) in the immediately preceding utterance.

(16a) The school garden was full of children.
(16b) It was grassy, green and fresh.
(16c) They/The children were in a festive MOOD.

As emerged from our discussion, the degree of fading away of the activation of elements of the stock of shared knowledge is not always the same. A very moderate fading takes place if the object, though not referred

to by direct mentioning, nevertheless still remains "on the scene" through associative links to objects mentioned in the given sentences.

To sum up our remarks, the following interrelations between the changes in activation of the elements of the stock of knowledge shared by the speaker and the hearer and the reflection of these changes in the linguistic rendering might be hypothesized and presented for further empirical investigation.

In a preliminary way, we can assign numerical values to the degrees of activation of the elements referred to by the items in underlying (tectogrammatical) representations of sentences, or TR's (see Hajičová and Vrbová, 1982; the 'rules' are reproduced from Sgall, Hajičová and Panevová, 1986:263); the flow of the discourse can be then represented by means of a scheme similar to that in Fig.4.

Tentative rules:[39]
(1) If $P(x_a)$, then $a^n \rightarrow a^n$.
(2) If $NP(x_a)$ is in the focus of S, then $a^n \rightarrow a^o$.
(3) If $NPd(x_a)$ is in the topic of S, then $a^n \rightarrow a^1$.
(4) If $a^n \rightarrow a^m$, then b^{m+2} obtains for every object b that is not itself referred to in (the TR of) S, but is immediately associated with an item present there.
(5) If *as for* x_a or *concerning* x_a is the leftmost expression in *S*, then $a^n \rightarrow a^1$.
(6) If x_a neither is included in S, nor refers to an associated object (see Rule (4) above), then $a^n \rightarrow a^{n+2}$.
Notation: x_a denotes an expression x referring to an object a; a^n denotes that this object is salient to the degree n in the stock of shared knowledge (the maximum of salience is denoted by n = O). To the left (right) of the arrow we indicate the state immediately preceding (following) the utterance of a sentence S in which x occurs; $P(x_a)$ denotes that x is expresed by a weak (unstressed) anaphoric pronoun or is deleted in S (albeit present in the TR concerned); $NP_d(x_a)$ denotes that x is a definite NP (including such expressions as *one of the* ...), and not just a weak pronoun.

Let us add that if an item is mentioned in the topic, then at least two issues are to be taken into consideration:

(i) a pronominal reference strengthens the activation of the item referred to to a lesser degree than a reference with a full (definite) noun group;

[39] The numerical values assigned to the individual items of the stock of knowledge are only tentative and we are fully aware that in a more definite proposal one should work with a wider scale and a more subtle differentiation on it.

(ii) the activation of the items referred to in the topic fades away less quickly than that of the items referred to (only) in the focus of the preceding utterance(s).

3.3 Topic of Discourse

In contemporary linguistics, discourse structure is often studied with specific attention concentrated on the coherence of a text, especially on coreference. However, it is a matter of high importance not to overlook the fact that the communicative function of natural language has its impact also in the structure of the sentence, viz. in the topic-focus articulation which is of primary importance for text coherence. This articulation was characterized in Part 2. We have sketched in Section 3.2 how this articulation and the coherence of the discourse interact with the degrees of activation (salience) of the items in the stocks of knowledge of the speaker and of the hearer. It should be borne in mind, of course, that human communicative activity, to which discourse belongs as a specific (though prototypical) case, is determined by much more complex issues than just the knowledge of language; discourse is influenced by factual knowledge, beliefs and other attitudes, aims and psychological motives of all kinds. Therefore, discourse should be viewed as a sequence (or even a more complex collection) of utterance tokens together with their sense (which includes reference assignment to the referring expressions contained in the utterance), rather than a sequence of sentences. A formal model of discourse thus belongs more to the domain of description of the use of language than to that of the language system.

Computational models of aspects of discourse have been often constructed in close connection with research in the experimental domain of AI; an interesting integrated approach to the structure of discourse was presented by Grosz and Sidner (1985). The authors assume the structure of discourse to be composed of three distinct but interacting constituents: (i) the structure of the actual sequence of utterances in the discourse (taken as a linguistic notion); the utterances in discourse can be grouped together into segments, the indications of the boundaries between them being mainly linguistic,[40] (ii) the structure of intentions (replacing Grosz's notion of 'task'

[40] The authors unduly assume that these linguistic means can be analyzed only on the discourse level rather than on the sentence level; they are not right in their claim that such questions as the influence of these (linguistic) elements on the truth conditions are irrelevant.

as used in her previous studies), and (iii) an attentional state. The components (ii) and (iii) are supposed to pertain to nonlinguistic notions.

The attentional state, which is most pertinent to the issues discussed in the present Section, contains information on the objects, properties and intentions that are the most salient ones in the given time point. Attentional state is supposed to be an abstraction of the so-called foci of attention of the participants of the discourse; it 'summarizes' the information presented in the preceding utterance tokens that is important for the processing of the given utterance token. It also supplies means of how to use the pieces of information supplied by the other two components for the generation and interpretation of the utterance tokens.

Some researchers - both in the fields of linguistics and of AI - claim that one should work with a special autonomous notion of a "discourse (text) topic" rather than with (or besides) a notion of a "sentence topic". One of the difficulties of such an approach is the fact that the notion of "discourse" itself is still somewhat unclear: How can discourse as a unit be identified? Should a discourse unit have a single topic or should each "discourse segment" (content, space, etc.) have a topic of its own? Is there one topic for each discourse segment or should we rather work with a set of topics for one segment?

Such questions can find answers on the basis of the salience in the stock of shared knowledge, as may be illustrated by a discussion of the segment of text presented in Section 3.2 above, and of the representation of the dynamics of salience in this segment, given in Fig.4.

Paying due regard to the changes of the activation of the elements of the stock of shared knowledge during the discourse may give us a sound basis for finding out the character of the scale (hierarchy) between the case when an item is marginally (once) mentioned in the discourse and the case in which just one item is foregrounded throughout the whole discourse, consisting of a single segment;[41] only in the latter case it would appear as fully appropriate to speak about the given discourse as having a single "topic".

If the scale is found to be smooth, continuous without significant or typical groupings of some kind, then it would be possible to state that only the scale itself can be established (and analyzed, e.g., statistically). On the other hand, if it is found that there are certain prototypical configurations on the scale, which occur rather frequently, others being just marginal, then these configurations may be used as points of departure for the specifications of "the

[41] In between, there may be cases of smaller or larger sets of items foregrounded for shorter or longer segments, or repeatedly, etc.

set of the topics of a segment of discourse", "...of a sequence of segments", etc., or of similar (or other) concepts. Our example[42] seems to suggest that a spectrum on the diagram can be singled out within which certain items remain foregrounded; if the activation of these items fades away, it does not fade too far and for a long time (e.g. 'teachers' between the utterance of (2b) and its reactivation in (5b) as contrasted to 'the garden' between (1) and (8), and then fading away again). There are, of course, other items that temporarily get into the foreground ('microphone' in (4a), 'the garden' in (1) and (8)), but their activation fades away rather quickly.

The patterning of a discourse is much more varied than the structure of a sentence. This can also be illustrated by the fact that the "topic" of the sample quoted above alternatively can be seen in something like "school festival", i.e. an event that is not explicitly mentioned in the discourse and thus cannot be identified in the text itself. Human understanding of the discourse presumably proceeds from the notions anchored in the expressions of the text (such as students, teachers, parents, festive mood of dressing, in our example) to some broader and more general notions (such as school festival). Parallel to that, one may assume that the explicit mentioning is provided for the nodes lower in the frame (script, scenario, plot ...) with "superordinated" nodes being derived from these lower levels; in such a case, the frame (script, scenario, plot ...) of a school festival is invoked by filling in its (obligatory) slots for participants of the festival, their manner of dressing, its place, etc. through their activation in the stock of knowledge. Thus it can be claimed that there are "topics" of text segments which are expressed more immediately in the utterances of each segment, and "topics" of the discourse, without such a relatively direct relationship to linguistic expressions. However, it would probably be easy to find cases where the "topic" of a segment has a less immediate relationship to the linguistic expression than the "topic(s)" of the whole discourse. Much more of empirical investigations is necessary, before anything more certain can be stated on the regularities of discourse patterning, and it seems that the changes in the hierarchy of activation should be taken into account in such studies.

A segmentation of the discourse (which itself still includes many open questions)[43] may be viewed from a similar angle. Trying to factor out

[42] We assume here that our sample from section 3.2 represents a whole discourse, although the sample consists just in the opening utterances of a text.

[43] Grosz and Sidner (1985) quote some papers which try to bring evidence for the segmentation to be possible; however, it has not yet been found out, e.g., what *criteria* can be used to distinguish

segments for our sample on the basis of changes of activation, one can (with certain hesitations and provisions) draw the following dividing lines:
A: (1) through (2) - children (pupils) are foregrounded;
B: (3) through (4) - parents are foregrounded, accompanied by a subsequent fading away of children;
C: (5) through (7) - in (5b) children are reactivated and teachers come to the foreground, too, with parents fading away;
D: (6) through (9) - from (6) on, children are fading away, teachers stay in the foreground and parents are reactivated;
E: (9) through (11) - in (9) the dressing comes into the foreground, with other items slowly fading away;
F: (12) through... - from (12) on, 'dressing' fades away.

The boundary between the above segments has been drawn at the point when the activation of (a) certain item(s) fades away in several subsequent utterances while (a) new item(s) is/are foregrounded. It would be interesting to compare the segmentation achieved in this way with those based on the considerations mentioned by Grosz and Sidner (1985).

The objective of our discussion in this Section was to show that the notion of the degrees of activation of the items in the stock of shared knowledge together with the representation of the dynamic development of the discourse by means of changes of these degrees offers a fruitful basis of the study of the interplay of factors important for such notions as "discourse topics" and "discourse segments". It should be stressed that the notion of a topic of a sentence has been relatively well established, referring to one of the parts of the representation of the meaning of the sentence. On the other hand, when speaking about "topic" of (segments of the) discourse, one rather has in mind items of the stock of knowledge the organization of which is not strictly regulated by rules or principles similar to those of grammar; the relationships of the items of the stock of knowledge to linguistic expressions in the given utterances are less immediate and less perspicuous. With some authors, especially Lötscher (1987), the notion of text topic is even more remote from the linguistic patterning of the text. The notions concerning "discourse topics" can be reliably established and fruitfully discussed only if they are anchored in a systematic analysis of the interplay between linguistic structuring of utterances and psychological factors determining the pattern of discourse.

We wanted to show that this issue is a good evidence for the necessity of a close cooperation of linguists, psychologists, specialists in AI and

between two discourses following each other and two parts (segments) of a single (entire) discourse, etc.

computer scientists, to be able to use effectively the results achieved in these domains for speeding up the investigation of a given issue.